# SUBSURFACE INVESTIGATION AND REPORT

ON THE

# RIVERFRONT DISPOSAL SITE

WOOD RIVER, ILLINOIS

FOR

AMOCO CHEMICALS CORPORATION

CONSULTANT

JAMES DOUGLAS ANDREWS, P.E. ENVIRONMENTAL ENGINEERING, INC.

SUBSURFACE EXPLORATION BY :

JOHN MATHES AND ASSOCIATES, INC.

OCTOBER 1980



# AMOCO CHEMICALS CORPORATION WOOD RIVER REFINERY/RIVERFRONT DISPOSAL SITE

# "SUBSURFACE INVESTIGATION & REPORT"

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#### - AMOCO WOOD RIVER REFINERY - RIVERFRONT DISPOSAL SITE -

#### SUMMARY

The results of the subsurface exploration and testing conducted under this study indicate that the Riverfront Disposal Site is underlain by a relatively thick, low-permeability natural clay barrier. This clay barrier separates the waste materials in the site from the sand and gravel aquifer which exists below the disposal site. The aquifer is heavily used and must be protected from pollutants.

The dikes surrounding the Impoundment Area may have allowed some lateral migration of liquids from the waste materials. Unless the lateral flow of liquids is retarded there will be movement of pollutants into the Mississippi River and into the Surge Pond Area and other areas surrounding the site. An effective barrier against the lateral movement of liquids from the site can be created by installing a soilbentonite or cement bentonite slurry wall surrounding the Impoundment Area. The installation of the wall will create a low-permeability membrane which should be effective in retarding the lateral movement of pollutants.

The installation of a clay cover over the entire Impoundment Area will minimize the amount of moisture infiltrating the site. This will reduce the quantity of potential pollutants and, also, the hydraulic pressure on the natural clay barrier and the slurry wall.

The isolation of the site will allow decomposition and stabilization of the waste materials to occur over an extended period of time without affecting the environment. The site has been extensively equipped for groundwater monitoring to give an early indication of adverse environmental effects, if they occur.

Estimates of the cost of measures designed to protect the site are as follows:

#### - AMOCO WOOD RIVER REFINERY - RIVERFRONT DISPOSAL SITE -

Installation of a slurry wall surrounding Impoundments 2 and 3. This wall would extend vertically from the ground surface, slightly into the surface of the underlying clay barrier.

The extimated cost of this work is \$325,000 - \$400,000.

- 2. Extension of the slurry wall to encompass Impoundments 1, 2 and 3 except for the levee separating Impoundment 1 and the Surge Pond Area. The extimated cost of this work in addition to the cost of corrective Action 1 is \$510,000 - \$380,000.
- 3. Installation of two feet minimum thickness clay cover over Impoundment Areas 1, 2 and 3 contoured to provide adequate surface runoff. Solid wastes from the refinery not classified as hazardous, such as water treatment sludge may be used in the re-contouring of the area.

The extimated cost of delivering fill and cover material to the site, placing and compacting, recontouring and revegetating the Impoundment Area is in the range of \$400,000 - \$1,625,000. The ultimate cost will depend upon the availability of cover material acceptable to the regulatory agencies in adequate quantities near the site.

- 4. Installation of a venting system for decomposition gases which would accumulate under the clay cover is estimated to cost in the range of \$25,000 \$50,000.
- 5. Continued monitoring of both upper and lower ground water levels utilizing the existing wells to insure that no pollutants are migrating from the Impoundment Area or the Surge Pond Area is estimated to cost in the range of \$25,000 per year.

# - AMOCO WOOD RIVER REFINERY - RIVERFRONT DISPOSAL SITE -

6. Providing security of the site in the form of a fence and/or television monitoring to prevent unauthorized dumping by others is estimated to cost in the range of \$100,000.

# AMOCO WOOD RIVER REFINERY RIVERFRONT DISPOSAL SITE

#### - SUBSURFACE INVESTIGATION & REPORT -

#### BACKGROUND

The Riverfront Disposal Site near the Amoco Refinery in Wood River, Illinois is an area of approximately 127 acres lying east of the Mississippi River and west of the refinery and Illinois Route 3. The main levee protecting Wood River is east of the disposal site. For convenience of description in this study the site is divided into two functional areas; the Impoundment Area and Surge Pond Area. The Impoundment Area in which plant residuals have been disposed is roughly triangular in configuration, consists of approximately 25 acres and is adjacent to a series of surge ponds used for temporary storage of water from the refinery. The Surge Pond Area consists of approximately 102 acres.

The Impoundment Area has received plant residuals from the refinery; and possibly from unauthorized disposal by others; for a period exceeding thirty years. The primary materials deposited at the site were spent filter clays, water softener sludges, catalyst fines, API separator sludge, cinders and flyash. However, there may be significant quantities of various other residues including caustic materials and sodium polysulfide in certain areas of the site. These materials are known to have been deposited in the area, although none have been specifically identified in samples taken during the current subsurface investigation.

In April, 1980 Amoco retained the firm of James Douglas Andrews, P.E., Environmental Engineering, Inc. and its key consultant, John Mathes & Associates, Inc., to conduct a study of the disposal site to determine the extent, if any, of adverse environmental effects resulting from the use of the site and to make recommendations for future actions to be taken by Amoco to allow limited use and/or restoration in compliance

with State and Federal regulations.

The study included a subsurface investigation to determine the nature and extent of subsurface materials including natural soils, fill materials, disposed residuals and groundwater. Samples were collected of the materials as the investigation proceeded and laboratory analyses have been made to more fully describe subsurface conditions. In addition, a continuing program of groundwater monitoring is being established to facilitate the detection of future changes in groundwater quality.

#### APPLICABLE STATE & FEDERAL STATUTES & REGULATIONS

The Impoundment Area at the Riverfront Disposal Site is primarily a solid waste disposal site as defined in the Resource Conservation and Recovery Act (P.L. 94-580) (RCRA) and in the Illinois Environmental Protection Act. Under RCRA the federal government promulgated its "Criteria for Classification of Solid Waste Disposal Facilities and Practices" on September 10, 1979. The Illinois Pollution Control Board adopted "Solid Waste Rules and Regulations" on July 27, 1973, defining the requirements for solid waste disposal in Illinois.

One of the objectives of this study is to assess the capability of the site to meet the criteria established for such sites by State and Federal authorities.

A review of the Federal requirements indicates that the site could fail to meet some of the criteria for compliance. Specifically, the criteria related to:

(1) Surface Water; (2) Ground Water; and (3) Floodplains may be questioned in relation to this facility.

The potential non-compliance related to surface water arises from the possible existence of a "...discernible,...discrete fissure...from which pollutants may be discharged." The area which may satisfy this non-compliance condition is the ap-

parent permeable layer at the interface of natural soils and fill materials on the riverward side of the levee along the Mississippi opposite Impoundment 2 and 3.

The potential non-compliance related to groundwater would arise in the event the monitoring wells display adverse effects traceable to the disposal site as a source. The deep aquifer would be the zone of principal concern.

The site could be found in non-compliance with the flood plain criteria because the surrounding levees may not protect the site against "...washout of solid waste" during the 100-year flood.

Should the site be determined to be in non-compliance with one or more of these criterion it could be included in the "Open Dump Inventory" published in the Federal Register. Under this circumstance the closure of the site would have to occur unless sufficient upgrading could be done to eliminate the non-compliance.

#### GEOLOGIC & HYDROLOGIC CONDITIONS

The subsurface investigation at the Riverfront Disposal Site included borings and monitor well installations in both the Impoundment Areas and the Surge Pond Area. Because the site is known to overlie a highly permeable and productive aquifer it is probable that any significant past migration of contaminants from the site could be detected within an area much larger than the 25 acres of the Impoundment Area.

The attached boring logs, piezometric contour maps and cross-sections (Appendix A). illustrate the conditions found to exist in the subsurface during the investigation performed by John Mathes & Associates, Inc., during April and May, 1980.

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Each boring was advanced until it encountered the sand layer which is known to exist uniformly beneath the site. This sand layer is hydrologically connected to the Mississippi River and is a major aquifer. The borings revealed the existence of a clay and silty clay layer ranging from five feet to more than twenty feet in thickness beneath most or all of the site. This clay layer appears to separate the waste materials from the underlying sand aquifer. Samples of the clay layer were collected from three widely separated areas and tested for permeability.

The samples displayed coefficients of permeability in the range of 1.29 to 3.06 x  $10^{-8}$  cm/sec. indicating that the clay will allow the movement of water only at a very slow rate. However, it was also found that a number of the samples in the upper portion of the clay layer displayed a characteristic hydrocarbon odor. This seems to indicate that hydrocarbon-bearing fluids have penetrated the clay barrier to some extent.

Examination of boring logs: B-1, B-2, B-3, B-4, B-6, B-7, B-8 B-10, B-13, B-14, B-15 and B-16, reveals that only in two borings was the hydrocarbon odor detectable below approximate E1. 400 MSL. In most of these boring locations the piezometric surface of the deep aquifer on May 27, 1980 was below E1. 400 MSL; probably reflecting the influence of pumping in the area. Under the controlled river elevations the normal pool seldom drops below E1. 398 MSL and, therefore, the gradient across the clay layer underlying the site is seldom a very large number. When the river rises above the normal pool elevation the gradient may actually reverse and the direction of movement within the clay layer may be upward.

In general, the investigation disclosed the existence of two piezometric surfaces over the site indicating the presence of a "perched" water table. The shallow or "perched" water table existed at a piezometric level ranging from El. 420 MSL to El. 412 MSL as measured in shallow piezometers on May 27, 1980. The gradient in the shallow piezometers was westerly, toward the Mississippi River. There was also a deeper piezometric surface ranging from El. 398 MSL to El. 391 MSL over the area

on May 27, 1980. The gradient in the deeper piezometers was north-easterly, probably toward the Amoco refinery wells. The perched water table and the water of the deeper sand aquiferseem to be separated by the relatively impermeable clay stratum.

Sixteen borings were advanced to depths ranging from thirty to seventy feet in an effort to define the nature of the underlying soils. In addition, three borings were made within the impoundment areas to determine the nature and amount of wastes contained in the site. Fifteen piezometers were placed in the deep boreholes and nine additional shallow piezometers were placed adjacent to the deep piezometers. This system of piezometers provides an excellent means of monitoring groundwater elevation and quality in the vicinity of the disposal site. Samples have been collected from the piezometers and results of the analyses are included herein. (Appendix D)

Details of the piezometer installations are given in the attached report by John Mathes & Associates, Inc. (Appendix A)

#### WASTE MATERIALS & AFFECTED EARTH MATERIALS

Because of the non-homogeneity of the disposed residuals and affected earth materials it is only possible to make estimates of the quantities involved. There are no existing records to corroborate the estimates. The boring logs and planimetered areas from recent aerial photographs of the site have been used to make gross calculations of the quantities of waste.

There are three subdivisions of the Impoundment Area designated as follows:

Impoundment 1 -- northernmost

Impoundment 2 -- middle

Impoundment 3 -- southernmost

In Impoundment 1, there appears to be an average 12 feet of residuals including solids, liquids and soil materials. Underlying the residuals there is an average 16 feet of affected earth materials (based upon the odors noted in the boring logs). It appears that only the upper portions of the in-place clay have been affected. The area of Impoundment 1 is 22.3 acres including all of the surrounding berms. It is unknown how much, if any, of the land west of the westernmost berm might be affected, considering that much of it may be composed of permeable fill.

Impoundment 2 exhibits an average 15 feet of residuals and 20 feet of underlying affected earth materials. In addition the surrounding berms appear to be affected to some extent by lateral migration of pollutants. In the following volume estimates it is assumed the area of the affected berm is 2.1 acres and Impoundment Area 2 is 2.39 acres.

Impoundment 3 displays 15 feet of residuals and 20 feet of underlying affected earth materials. Also, the surrounding berms appear to be affected by lateral migration of pollutants. In the following volume extimates it is assumed the area of the affected berm is 2.48 acres and Impoundment Area 3 is 1.93 acres.

The approximate volumes of residuals and affected materials are calculated from the estimates given above:

	RESIDUALS	AFFECTED EARTH	TOTAL
Impoundment 1	428,000 cu yd	571,000 cu yd	999,000 cu yd
Impoundment 2	57,000 cu yd	195,000 cu yd	252,000 cu yd
Impounment 3	46,000 cu yd	201,000 cu yd	247,000 cu yd
Total:	531,000 cu yd	967,000 cu yd	1,498,000 cu yd

It is assumed in this calculation that any pollutants which may have migrated from the Impoundment Area and affected earth materials beyond the berms of the Impoundment Area is insignificantly small by comparison with the residuals and affected earth

materials within the area itself.

In determining the total quantity of residuals and potentially affected earth materials it is assumed that the surge pond area east and south of Impoundment 2 in the vicinity of B-12 and a 100 foot wide strip north and west of the Impoundment Area are affected.

	RES	IDUALS		CTED ATERIALS	TO	TAL
	max.	min.	max.	min.	max.	min.
Impoundment Area	531,000	531,000	967,000	967,000	1,498,000	1,498,000
Fringe Area			283,000		283,000	
Total:	531,000	531,000	1,250,000	967,000	1,781,000	1,498,600

#### REGULATORY STATUS & POSSIBLE CORRECTIVE ACTIONS

The Riverfront Disposal Site is under current surveillance by the Illinois E.P.A. (IEPA) Field Operations Section. In recent months IEPA personnel have expressed concern regarding the site and have requested that action be taken to halt the use of the site for waste disposal. In response Amoco has advised IEPA that the current study is being conducted and has also conducted cleanup operations in portions of the site. It is possible that IEPA will initiate an action before the Illinois Pollution Control Board (IPCB) to force cessation of disposal operations and remedy any environmental damage.

Under federal regulations adopted pursuant to RCRA the site is subject to being classified as an "Open Dump" under the inventory efforts which are currently in progress. An adverse effect of this inventory would be publication of the "Open Dump" sites in a national listing. Also, it is highly probable that such a listing would trigger an enforcement action at the state or federal level.

Because the current study reveals conditions which could lead to adverse environmental effects and may show that such effects already have occurred on a limited scale, there

are some possible corrective actions which should be considered. These are described generally in the following paragraphs:

1. Pollutants could be released from Impoundment Areas 2 and 3 laterally through the levee bordering the Mississippi River. A minimum program for containment involves a slurry wall of impermeable material such as soil-bentonite or cement-bentonite which would encompass these areas. The slurry wall would extend slightly into the surface of the underlying clay layer. This work may be hindered by the nature of the materials used in constructing the levee, and, also, by the relatively small lateral clearance between the Impoundment Area and the Mississippi River.

The construction of the slurry wall may require some dewatering of the wastes in Impoundments 2 and 3. A liquid collection and removal system could be installed within these impoundments to reduce the hydrostatic head. The liquid removed from the impoundments may be circulated to the Amoco Refinery's wastewater treatment system before discharge.

2. There is evidence that migration of pollutants may be occurring around Impoundment Area 1. A slurry wall such as described above could be placed around that Area if future monitoring indicates a need.

The berm dividing Impoundment 1 from the Surge Pond Area, appears to be constructed of clay materials and should be reasonably impermeable.

3. The Impoundment Area should be capped to reduce further infiltration of moisture.

Most of the waste material is deposited above the shallow water table and capping will reduce the leaching effects from infiltration. Ideally, this could be accomplished in part by continuing disposal of inocuous plant wastes such as water softener sludge which is generated in rather large quantities. The remaining fill capacity to bring the Impoundment Area to an elevation near the top

of the surrounding berms is approximately 357,000 cubic yards. Cover material required to place a final cover of two feet over the Impoundment Area would be approximately 100,000 cubic yards. A thick grassy sod should be maintained over the cover material to prevent washouts from flooding.

If the Impoundment Area cannot be permitted for filling with inocuous plant wastes or other available materials, it may be necessary to re-contour the site to obtain adequate drainage without importing a very large quantity of fill material.

- 4. There is some possibility of lateral migration of decomposition gases if a highly impermeable cover is placed on the site. A system of filling should be planned which incorporates the use of coarse-grained materials over the residuals and beneath the final cover; along with an adequate number of atmospheric vent stacks; to assure the relief of gas pressure within the fill material.
- 5. Both the shallow aquifer and the deeper aquifer should be periodically sampled and analyzed to reveal the migration of pollutants, if it occurs. A group of parameters designed to indicate the occurrence of migration should be devised and submitted to the appropriate regulatory agencies for approval.
- 6. Unauthorized access to the site should be prohibited by constructing adequate fencing and/or the installation of television monitoring.
- 7. It is suggested that the Surge Pond Area be observed for a period of time through the installation and sampling of two additional shallow monitor wells at the eastern edge near the northern end. If these wells indicate adverse effects, additional extensions of the slurry wall may be required.

#### NOTES

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It appears obvious that pollutant migration my occur through the berms and/or fill at the surface of the in-place clay. Even though a portion of the berms were constructed with dredgings of silt and clay, they probably were not well-compacted and are permeable to a degree. The upper areas of the in-place clay may be affected, but the clay itself seems to be adequately protecting the water-bearing sand which underlies it.

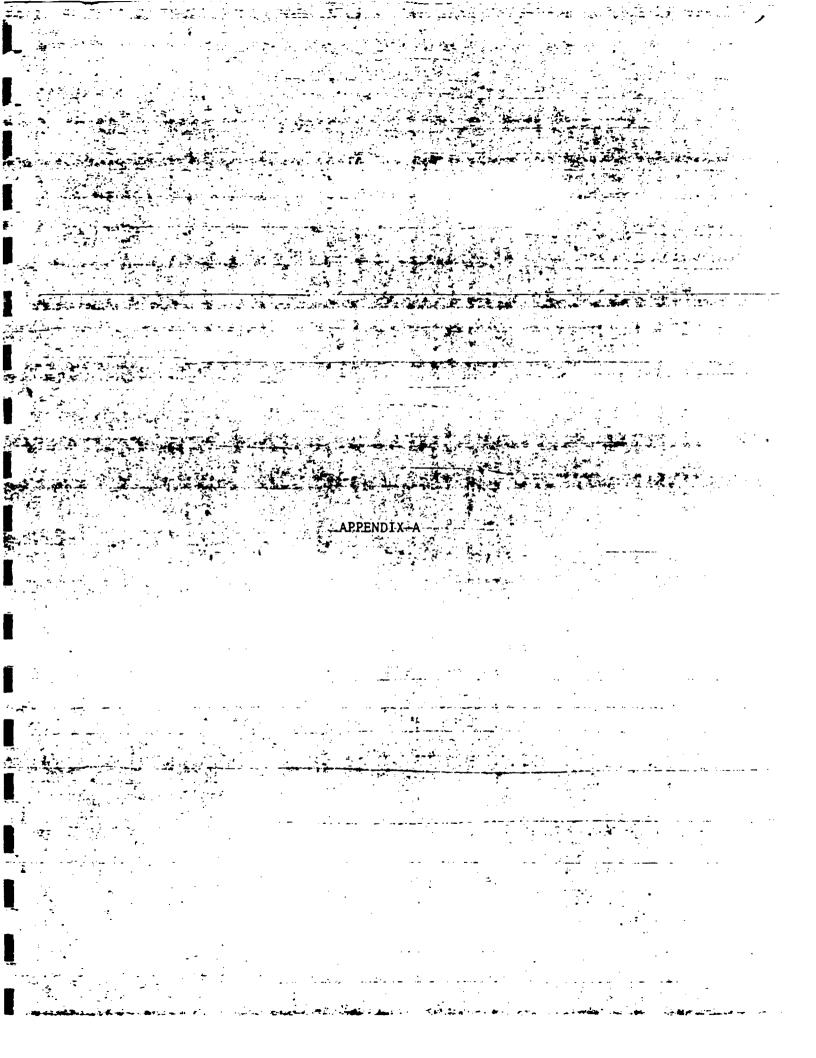
To save time and construction costs, this should be verified over a period of time by water samples from the sand and from the perched zone.

Although additional berms could be emplaced, it is believed that the slurry wall may be the more effective solution, both constructionally and cost-wise. With the slurry wall in-place, additional inocuous fill could be placed and final cover added.

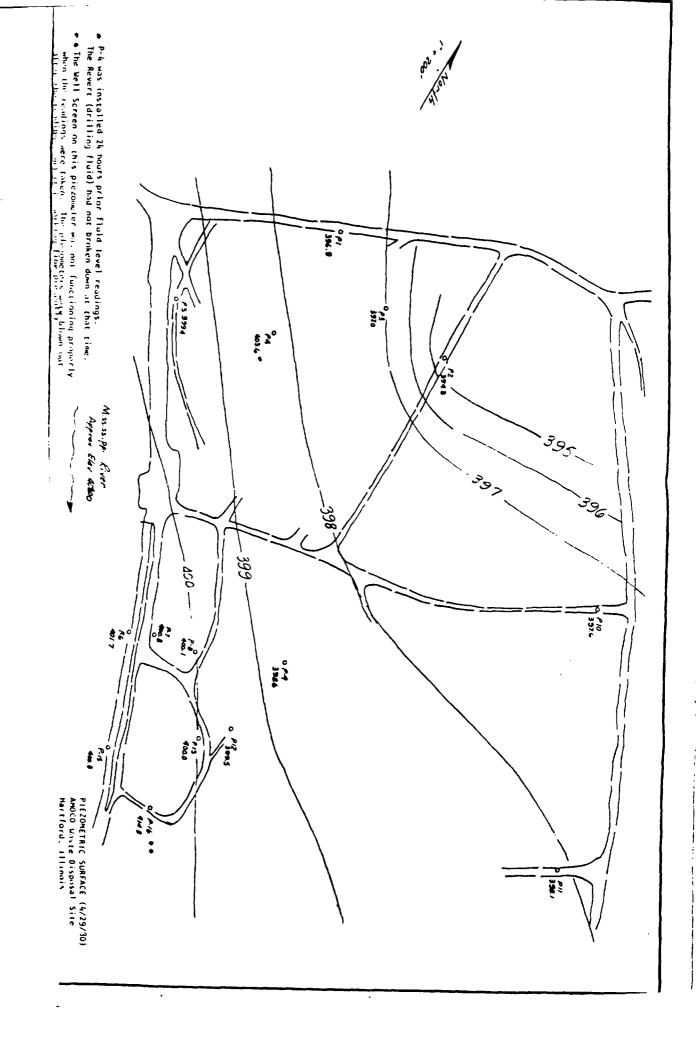
Some form of slurry wall or equivalent construction will have to be installed to prevent the migration of pollutants into the Mississippi River. A slurry wall only along the Mississippi will provide a temporary dam around which perched, pollutant-laden water will eventually find another route. The Impoundment Areas should be completely encompassed and eventually covered. Some effort should also be made to control the addition of fluid. Once the slurry wall is in-place, there is no reason why non-hazardous solid waste fill could not continue to take place, although addition of fluids should be limited or controlled.

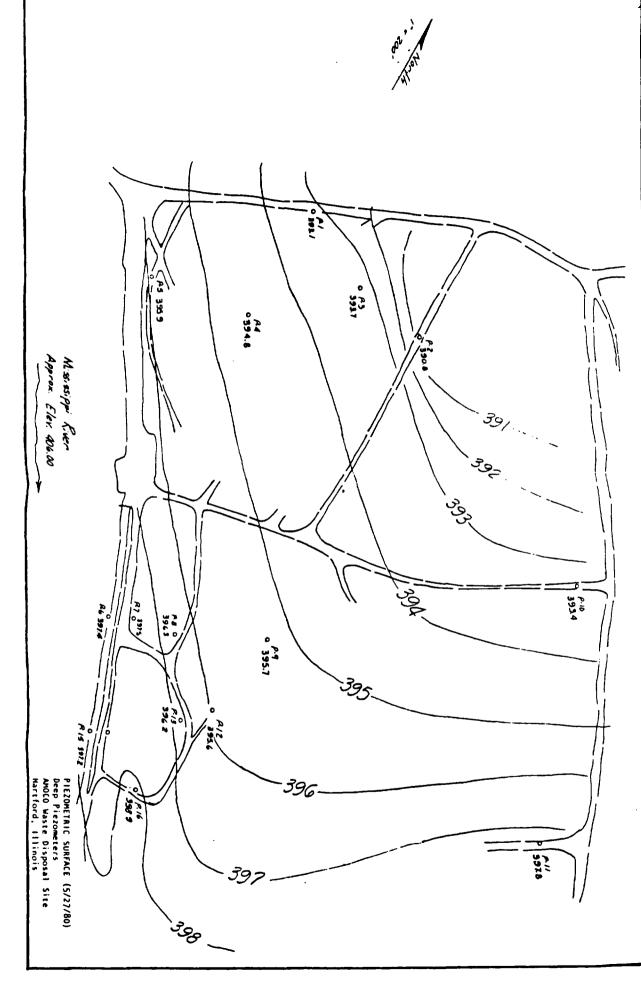
Further, considering that some clean-up of at least the northernmost surge pond may be necessary, it is thought that there may be some advantage in extending the slurry wall around that area. However, it is suggested that a final decision in this regard await results of additional groundwater monitoring.

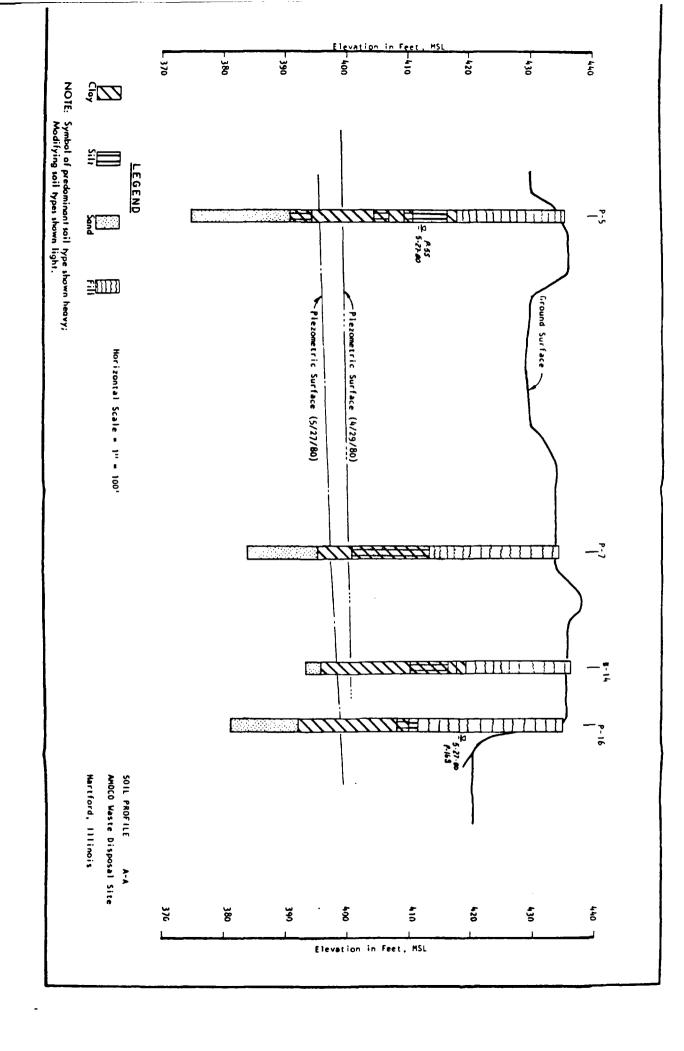
Considering the problems of siting a new disposal area in Madison County, probably at some distance from the point of generation, with the attendant developmental and hauling costs and public opposition; the additional capacity for on-site non-hazardous waste fill may be advantageous.

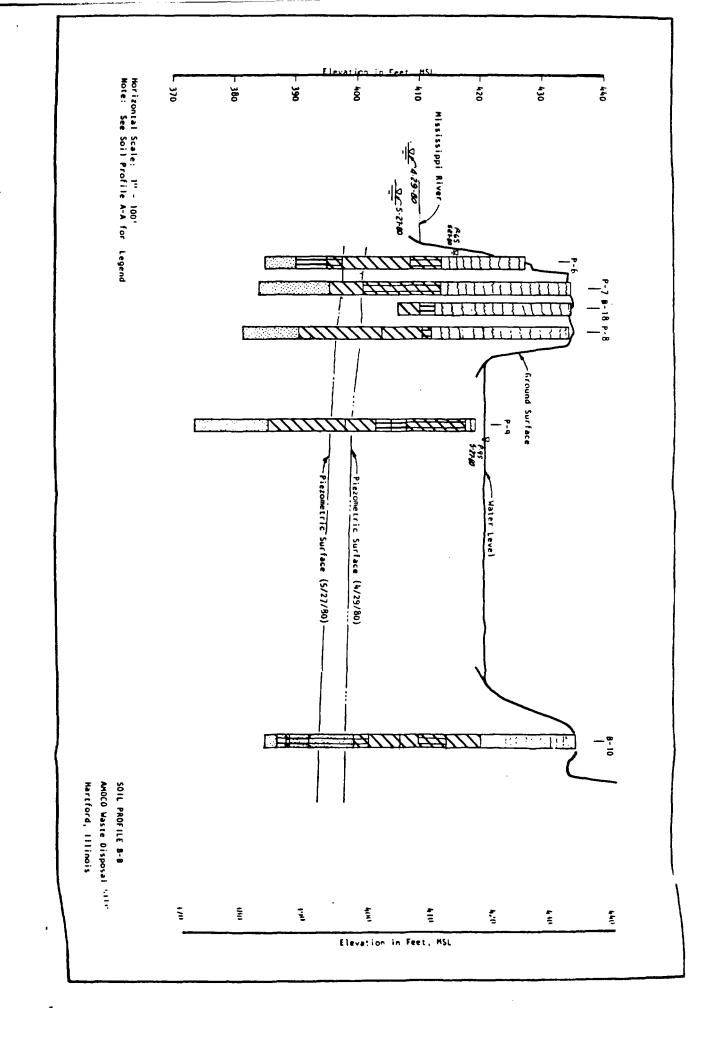


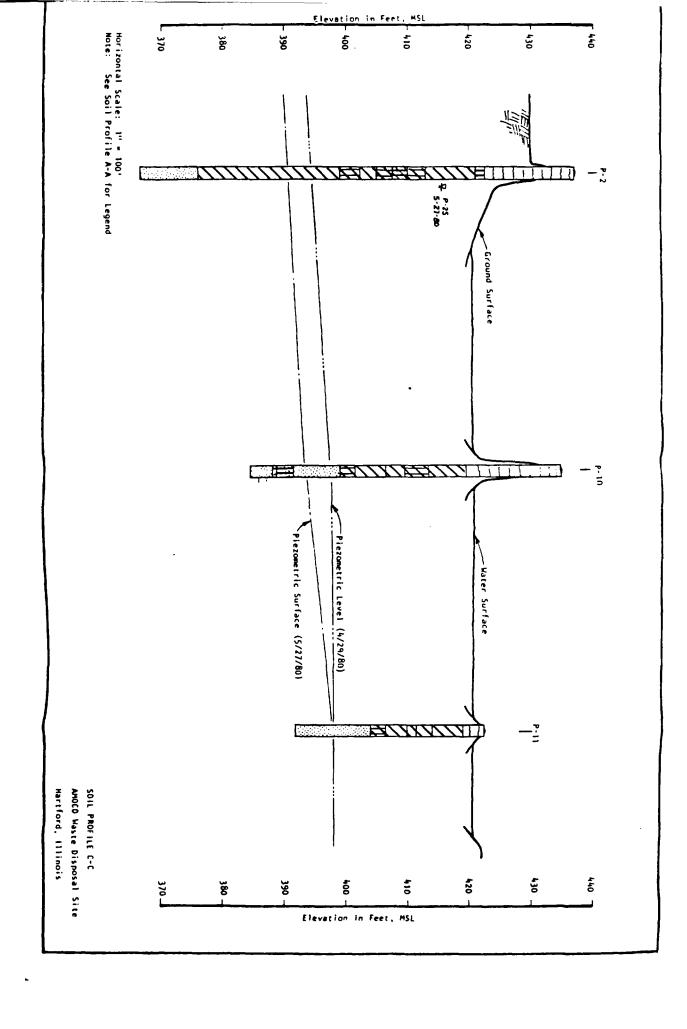
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# ELEVATION DATA SHEET AMOCO Waste Disposal Site

April 29, 1980

L	ocation Number	Water Elevation	Ground Elevation	Top of Pipe Elevation
ı	_	•••	100.40	
ı	1	396.92	432.12	433.52
	2 3 4	394.29	436.79	438.96
	3	397.03	429.43	431.30
	4	403.56	425.76	429.03
	5 6	399.43	435.64	436.30
	6	401.71	427.19	429.02
	7	400.78	434.68	436.70
	7 8	400.13	433.73	435.74
	9	398.58	418.98	420.87
	10	397.58	435.08	435.98
	11	398.11	422.60	423.70
	12	399.54	419.46	422.55
	13	400.04	437.64	437.79
	14	-	436.50	-
	15	400.82	426.12	429.96
	16	414.76	435.26	437.72
	17	-	429.19	-
	18	-	434.43	-
	19	-	437.46	-
	15	-	432.20	<b>43</b> 2.94
	25	•	437.13	438.96
	58	•	435.64	437.31
	65	-	427.19	429.64
	95	_	419.01	420.33
	125	-	419.48	420.76
	155	_	426.35	428.63
	168	-	435.36	437.56
	145	-	436.50	438.60

# ELEVATION DATA SHEET

# AMOCO Waste Disposal Site May 27, 1980

1			
1			Top of Pipe
cation Number	Water Elevation	Ground Elevation	Elevation
1	393.12	432.12	433.52
2	<b>3</b> 90. <b>7</b> 6	436.79	438.96
3	393.70	429.43	431.30
4	394.83	425.76	429.03
5	395.90	435.64	<b>436.3</b> 0
6	397.42	427.19	429.02
7	397.50	434.68	<b>436.7</b> 0
1 2 3 4 5 6 7 8	396.34	433.73	435.74
	395.67	418.98	420.87
10	393.38	<b>43</b> 5.08	<b>43</b> 5.98
11	397.80	422.60	423.70
12	<b>395.55</b>	419.46	422.55
13	396.19	437.64	437.79
14	-	436.50	_
15	397 <b>.</b> 16	426.12	429.96
16	398.92	435.26	437.72
17	<del>-</del>	429.19	_
18	_	434.43	-
19	-	437.46	_
18	413.54	432.20	432.94
2S	415.56	437.13	438.96
5S	412.11	435.64	437.31
6S	415.54	427.19	429.64
98	420.00	419.01	420,33
128	420.00	419.48	420.76
158	415.43	426.35	428.63
168	418.56	435.36	437.56
145	428.20	436.50	438.60

	PROJ	ECT_	A	moco Wa	ste Disposal Site	BORING		1			10	HI M		S 2	
1							÷	Ι.	s	HEAR				SF 0	
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2					Brown Silty CLAY - w/Roots								1		
2		1	\$\$		Crushed Stone & Dark Gray Silty CLAY	7-3		 		_			$\frac{1}{1}$		$\pm$
D BY	- 5 -	2	SS		Dark Gray & Dark Brown CLAY w/Silt Pockets & Oxid. Spots To Dark Gray w/Traces of	2-4				<del>\</del>	b		+	<del> </del>	+-
LOGGED BY		3	SS	Slight Odor	Fine SAND Dark Brown CLAY & Gravel	12-12				7			1		
	- 10	4	\$\$		Dk Gr Br CLAY w/51 & Oxi Sp . Black Silty & Fine Sandy FLYASH	2-2			-				$\frac{1}{4}$	$\frac{1}{1}$	+
		5	SS	Slight Odor		1-9				1			>	+	
2	-15 -	6	SS		Dark Brownish Gray CLAY w/ Oxidized Spots Grayish Brown CLAY w/Silty	1-3				1			1	-	
2		7	SS	Slight Odor	Pockets & Lenses	1-2				#		+	+	+	
OMETER	-20 -	8	SS	Slight Odor	Brownish Gray Clayey SILT w/ Oxidized Stains & Traces of Fine Sand	1-2			1					1	
PIEZ		9	SS	Slight Odor	Dark Gray Silty CLAY w/Black Spots & Stains -w/Traces of Sand Below 24.5'	WH- 1			ď	#			+		
	-25 -	10	SS	Water € 24.0'		1-2		-		1		$\dashv$	+	+	-
3		11	55	Strong Odor	Dark Gray CLAY	2-2					O,		1	1	
HO0	-30 -	12	SS	Odor	-w/Silty Pockets & Lenses & Oxidized & Black Spots @27.5 -w/Oxidized Matter & Stains From 29.5' to 33.5'	1-1			,	1				1	
ILLING METHOD		13	\$\$		· · · · · · · · · · · · · · · · · · ·	1-1			, ,	+			7	1	
ב	-35 -	۱		1	Contd	WH-1					⇊			4	4

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DRILLED BY

4/15/80

JOHN MATHES & ASSOCIATES, INC.

GROUND WATER DEPTH AT COMPLETION.

AFTER 14 days

35.2 AFTER

		PROJ	ECT_		oco Was	te Disposal Site	BORING	1	cc	onto. —	Ī	TOME TOME	MATH	15	
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		DEPTH (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT PCF	0 K+	+ <del></del>	VATER	<del>-+</del> -	1.5 CONTE	20 	+ - : :
		ľ	}	}	}	ELEVATION 397.12		DAY	0	20	1 40		60	■0	- + , 100
			14	\$5		Dark Gray CLAY	WH-1					$\Box$		1	1
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8√	₩	-40 -	16	SS		39.5'	WH-1			P	1	$\frac{1}{4}$	++	1	+
DRILLÉD BY	LOGGED BY		17	<b>\$</b> \$			WH-2			o I	11	$\frac{1}{1}$	+#		+
		-45-	18	SS			1-1	i		i P		1			
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			19	SS		Dark Gray Silty Fine SAND  Dk Gr CLAY w/Fi Sand Parting	1-2			Ö		4	$\frac{1}{1}$		+
4/15/80		-50 <b>-</b>	20	SS	Began Wash	Gray to Dark Gray Silty Fine SAND w/Traces of Lignite	4-5					$\frac{1}{1}$		+	<del> </del>
4/1	Yes	<u> </u>	21	SS	Bore € 51.0'		12-15	•				1	++	$\perp$	+
DATE DRILLED	PIEZOMETER_	-55 -	22	SS			9-12				+			1	+
TED	ZON				{							二		土	
۵	<u> </u>	ļ	23	SS		T.O.B.	12-14		-		++	$\dashv$	+	+	╀
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CONTRACT	DRILLING METHOD		]	ļ	•						$\square$	$\Box$			1
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					TER DEPTH		l4 days _	_35_	2'/	AFTER,					_
							N MATHE	S &	AS	SSO	CIA	TE	S, I1	VC.	

PROJECT \_\_\_\_\_\_BORING \_\_\_\_\_\_

DRILLED BY

DATE DRILLED \_\_



1							÷	-	SH	AR STE		H. TSF	
	<b>DEPTH (FT.)</b>	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF  MATERIAL	BLOWS	DRY UNIT WEIGHT PCF	• <del>•</del>	0.5	1.0	1.5	2.	0 2.
	DEP	ŞŞ	SA	ž	1.4	<b>B</b> 1	RY UN	PL -	w	ATER (	CON	ITENT.	<u>•</u> 4
İ					SURFACE ELEVATION 136,79 CINDERS		٥	1	1	<del>1                                    </del>	6.0	<del> </del>	, <u>''</u>
اید									+	11		-	-
8 Jack		1	55		Brown CLAY w/Silt, Oxidized Spots & Traces of Fine Sand	7-10						-	
	-5 -	2	55		-Brown & Brown Gray From 4.0'	8-10						-	
LOGGED BY		,	SS			8-12			1				
990		3	33			112			+	-	H	+	
	-10 -	4	<b>5</b> 5		-Brown From 11.5'	8-12							
		5	SS <sup>1</sup>			7-9			-				
	-15 -	6	55		Grayish Brown SILT w/Fine	3-10			-			+	/
Yes		7	SS		SAND Brown & Brownish Gray CLAY w/Silt, Oxidized Spots &	5-8						1	
TER_	-20 -	8	SS		Traces of Fine Sand	6-6							
PIEZOMETER	20	ľ	33		-Grayish Brown From 21.5'	0-0			+		+-		╁┼
PIE		9	ss			1-3			0.				
	-25 -	10	SS	Slight Odor	widy o block stilly cent wi	3-4						- 0	
V. B.		•		ļ	Organics & Traces of Fine Sand							1	
w	_	11	SS	Slight Odor	Dark Brownish Gray Clayey SILT w/Sandy Seams & Black	3-6			,		-	$\pm$	
H.A.	-30 -	12	SS	Slight Odor Water	Organics Dark Gray & Black Silty CLAY	1-1			0				
DRILLING METHOD		13	SS	e 31.0'	Dark Gray Clay w/Silt, & Oxidized Spots	1-3			1			-	
RILLING	35	14	SS	Odor	Gr: Si CLAY w/Tru of Organics	1-2			<del>/</del> 1	+	<del>   </del>	+	
DAIL	35	<u> </u>		<u> </u>	contd.  AT COMPLETION Yes AFTER 2		1.3'			28 da	<u> </u>	4	2.

JOHN MATHES & ASSOCIATES, INC.

Amoco Waste Disposal Site 2 contd. PROJECT. BORING SHEAR STRENGTH, TSF DRY UNIT WEIGHT PCF DEPTH (FT.) SAMPLE SAMPLE TYPE BLOWS **DESCRIPTION OF MATERIAL** WATER CONTENT % 401 79 ELEVATION\_ SS Gray Silty CLAY w/Traces of 14 Organics -w/Black Spots @ 36.5' Black Slight 15 **S**S Gray CLAY w/Black Spots WH-3 Odor -Dark Gray From 39.0' to 4/2/80 40 45.51 1-2 16 Water @ 41.3' LOGGED BY 55 17 WH-2 45 18 SS WH/9"-1/3" 2.82×10-SS\_cms/sec 19 WH - WH -Gray & Dark Gray @ 49.0' ÇıcWH=WH 🤯 -50 20 SS - Dark Gray Below 51.5' Yes WH/9'51/3'' 22 21 PIEZOMETER WH-2 -55 SS 22 WH/9"-1/3" 23 SS Gray CLAY w/Silt & Black Spots 6 60 24 SS WH-1 V. B. Gray Fine SAND w/Silt 1-2 25 SS w H.A. -Fine-Medium Below 64.0' 65 26 SS 4-5 DRILLING METHOD 27 9-9 70 28 SS 16-19 TOB 41.31 AFTER 28 days 42.5' AFTER 24 hrs. GROUND WATER DEPTH AT COMPLETION \_

JOHN MATHES & ASSOCIATES, INC.

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	·				RECORD OF SUBSURFACE E	XPLURATIO	N					Ī	T	1		
	PROJ	ECT_		Amoco	Waste Disposal Site	BORING	3		_		Ϋ́			戛		
							ŧ	<b>8</b> V	Si	EAR	STR OP		тн,	TSF	_	
	ОЕРТН (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	0 +	0.5	VATE	10	- 	.5 <del>                                     </del>	2 0 +		2. LI
					SURFACE ELEVATION 429,43		(HO	• +	20	<b>_</b>	40	<b>_</b> •	<u>ه</u>	•0	,	10
Black		1	SS	HCa Odor	Brown Gray Silty CLAY w/Sand & Traces of Gravel	4-12			+	1	<del> </del>			<del> </del>		_
B				1	Black Silty & Fine Sandy						Z			<del>-</del>		
<u>}</u>	_ 5_	2	\$\$	HC <sub>a</sub> Odor	FLYASH	10-11			+		+		Ì	$\frac{1}{1}$		
LOGGED BY		3	\$5	HCa Odor		4-4			$\pm$			1		4	_	
	-10-	4	SS	HCaOdor Water @ 9.5'		1-12			+			.1.1				
		5	SSI	HCa Odor	Dark Gray Clay w/Black Spots	3-5					17	2				
S	-15-	6	SS	ł	Dk Gr CLAY w/Silt, Black Sp & Fine Sandy & Silty Lenses Interbedded Seams of Gray	1-2			þ		1			$\frac{1}{1}$		
A Yes		7	55	HCa Odor	E Dark Gray Clayey SILT, Silty CLAY & Fine Sandy SILT w/Oxidized Stains	1-2										
OMETER	-20-	8	\$\$	HC a Odor	Dark Gray & Black CLAY	WH-2			4	+	+-			<del> </del>		
PIEZO!		9	SS	HC∌0dor	w/Silt & Oxidized Spots	2-3			-	+	‡			$\dashv$		
	_25_	10	\$\$	HC@Odor	-Gray & Dark Gray w/Black Spots From 24.5'	2-3			0	•						
. 6 W.B		11	SS	HCą0dor		2-3			- <u>[}</u>	2				<del> </del>		
A. H.	-30-	12	\$\$	-	Dark Gray CLAY -w/Silty Pockets @ 29.0' -w/Silty Partings @ 31.5'	1-2			7				7	,		
METH		13	SS			WH-2				1	+			<b>)</b>		_
CONTHACT	-35-	14	SS	<u> </u>	-Dark Gray & Black @ 34.0'	WH-1			<b>;</b>	+	_		-	<u> </u>	_	
ة د 				TER DEPTH		days :	32.4		TER			- -	<b>ل</b> ــــا		 	_

					RECORD OF SUBSURFACE E	XPLORATIO	N						
	PROJ	ECT_	<del></del> ·	Amoco Wa	ste Disposal Site	BORING	3	con	d.	70	HIN M	THES	
	ОЕРТН (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF MATERIAL  ELEVATION 394,43	BLOWS	DRY UNIT WEIGHT	8v _ 0 + 0	0.5	1.0	15		0 2 0 2
	-	14	55		Dark Gray CLAY		1	1	+	1	<del>                                     </del>	1	
Black	40	15		·		WH-2		i c					
, ' ¥ ¥	Г -				-Dark Gray & Black @ 41.5'		1				П	$\mathcal{V}$	
DRILLED BY		17	SS			1-3			1 1			$\frac{1}{1}$	
د ه 	-45-	18	\$5			12-1		0			1		
0.0	-50-	19	SS		SAND  Dk Gr CLAY w/fi Sa Partings  Dark Gray Silty Fine SAND	5-12		0					
TER Yes	-55 -	20	SS	Began WB@54.0		17-20							
DATE DRILLEU PIEZOMETER				-	-Dark Brownish Gray Fine-								
1.A. & W.B.	-60 -	21	SS		Medium w/Silt From 59.0' TOB	13-20							
1 -	-65-												
CONTRACT CONTRACT													
				TER DEPTH 5'	AT COMPLETION AFTERJOH	5 days	32. S &	. Ar		IAT	- ES,	- INC	 >. —

	ОЕРТН (FT.)	SAMPLE NUMBER	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT PCF	64 64 1	0.1	HEA J	1,0	OP/2	1.5	H. TS	20
					SURFACE ELEVATION 425.76		, HO	0	24	<u> </u>	40		60	+	<b>a</b> 0
				<u> </u>	Fill			Ц	4	_	4	$\dashv$	$\dashv$	+-	4
		1	SS	HC@Odor	Black Silty CLAY w/Sand	1-4				*	1		P	+	4
	- 5-	2	SS	HC aOdor	-w/Traces of Gravel @ 4.0'	3-3			•		4	1	$\frac{1}{1}$	+	<del> </del>
LOGGED BY		3	SS		Black Silty & Fine Sandy FLYASH	2-2		٥	/	7	1	+	$\ddagger$	+	+
106		_		HC aOdor	r E i Man				٥, ر	1	#	+	+	+	1
	-10 -	4	SS	Water		3-7			I	1	$\exists$	ユ	1	1	_
		5	SS	@ 10.5' HC@Odor	Black Coarse Grained THERMAL COKE & Fine Sandy FLYASH	1-4				1	+	+	+	+	
	_15_	6	SS	HCaOdor		1-1			$\rightarrow$		+	+	+	+	
		7	\$\$	HCa0dor	Gray Silty CLAY w/Oxidized Spots & Stains -w/Traces of Fine Roots @	1-2				Þ		+	+	+	1
METER .	20_	8	\$S.	HCaOdor Began	-w/Fine Sandy Partings € 19.0	1-2				-	1	7	+	+	_
PIEZON		9	SS	WB € 20. HCaOdor	Dark Gray CLAY -w/Sandy Lenses @ 22.5' -w/Black Spots From 22.5' to	1-1			- P		7	N	1	1	_
	-25 -				29.0'								7		
				HC <sub>a</sub> 0dor		1-1			; ; 5	+	_	<del> </del>	+	$\uparrow$	7
	-30 -	10	55	110,000							+	1	+	‡,	1
ETHOO					-Dark Gray & Black	•					4	+	+	#	1 1
DAILLING METHOD		11	SS			WH-2				1	$\dashv$	7	+	7	
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		DEPTH (FT.) SAMPLE NUMBER	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT		0.5			<del></del>		20 2.5	
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2			11	SS		Dark Gray CLAY								$\perp$	
Roberts	Black	<u> </u>	-			Dark Gray Silty Fine SAND			H		$\vdash \vdash$	- -	++		$\vdash$
8	8		12	SS			10-13								
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S	۵	<b>L</b>	GROU	TAW DN	ER DEPTH	AFTE	4 days	22	2'^	FTER_			<u> </u>		<u>—</u>
.—-			8CAL	E 1" =_	5'		OHN MATHE	S&	AS	SO	CIA <sup>-</sup>	TES	s, IN	IC.	_

RECORD OF SUBSURFACE EXPLORATION Amoco Waste Disposal Site BORING . PROJECT \_ SHEAR STRENGTH, TSF DAY UNIT WEIGHT PCF DEPTH (FT.) BLOWS NOTES **DESCRIPTION OF** MATERIAL WATER \_ CONTENT. % 435.64 SURFACE ELEVATION \_ Black Silty & Sandy FLYASH 1 55 2-2 5 SS 1-2 2 LOGGED BY 3 SS 1-1 Ļ -10 -SS 2-4 SS 5 3-3 -15-SS 1-1 Water 1/12" - 1 SS © 17.5 Dark Grav & Black CLAY w/ 7 Interbedded Gray Silty Fine PIEZOMETER -20 -8 SS SAND & Fine Sandy SILT Seams 2-1 w/Oxidized Stains 9 SS 2-2 Slight 25 -10 1/12" 55 Odor Brownish-Gray Silty CLAY W/ Water Oxidized Spots € 26.0 Dark Gray & Black CLAY w/ Hollow 11 SS Oxidized Spots & Silty 1-2 **Pockets** Dark Gray & Gray Silty CLAY -30 -12 55 1-1 w/Oxidized Snots & Stains DRILLING METHOD Gray CLAY 1.29x10=8 WH- 2 -w/0xidized Snots € 31.5' 13 SS cms/sec -Dark Gray Below 34.0' -w/Black Spots A 34.0' WR-2 -35 14 SS contd.

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DRILLED BY

4/3/80

DATE DRILLED

Auger

CONTRACT

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Jack

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36.0' AFTER 26 days GROUND WATER DEPTH AT COMPLETION Yes AFTER SCALE 1" -\_\_\_5"

Amoco Waste Disposal Site 5 contd. PROJECT . BORING SHEAR STRENGTH, TSF UNIT WEIGHT DEPTH (FT.) SAMPLE BLOWS NOTES SAMPLE **DESCRIPTION OF MATERIAL** WATER CONTENT. % DRY 400.64 ELEVATION. TITAY LLAY -Dark Gray & Black @ 36.5' Black WR79"176"-1/3" 15 -w/Black Snots @ 39.0' WH-2 -40 16 DRILLED BY LOGGED BY Dark Gray Fine Sandy Silty 17 CLAY 1-2 -45 -18 6-8 Dark Grav Silty Fine-Medium SAND w/Traces of Liquite 4-4 19 -w/1" Clay Seam @ 49.0' 6-10 80/ر -50 20 Yes ř 6 - 1121 DATE DRILLED PIEZOMETER \_55. 22 5-4 23 6-5 60 24 -Gray 10-12 Auger - TOB Hollow 65 DRILLING METHOD CONTRACI AFTER 26 days GROUND WATER DEPTH AT COMPLETION\_ **8CALE 1" -**-JOHN MATHES & ASSOCIATES, INC.

CRIPTION OF ATERIAL  TION 427.19  & Brown Silty CLA /Sand  w/Sand & Cinders  CLAY w/Oxidized & S. & Traces of Sa  Clayey Silt w/Finck Spots  Silty CLAY w/Blac  Fine Sand @ 14.0'	14-19 5 14-11 7-11 6 4-4 ne 6-6 ck 2-2	DRY UNIT WEIGHT PCF	05 WATE 20	10 1 H C	ONTENT
E Brown Silty CLA/Sand  W/Sand & Cinders  CLAY w/Oxidized & S. & Traces of Sa  Clayey Silt w/Finck Spots  Silty CLAY w/Blac  Fine Sand @ 14.0	14-19 5 14-11 7-11 6 4-4 ne 6-6 ck 2-2			•	
w/Sand & Cinders  CLAY w/Oxidized & s, & Traces of Sa  Clayey Silt w/Finck Spots  Silty CLAY w/Blac  Fine Sand @ 14.0	7-11 6 4-4 ne 6-6			•	
CLAY w/Oxidized & s, & Traces of Sa Clayey Silt w/Finck Spots Silty CLAY w/Blac	7-11 6 4-4 ne 6-6 ck 2-2			•	
s, & Traces of Sa Clayey Silt w/Fin ck Spots Silty CLAY w/Blac Fine Sand @ 14.0'	6-6 ck 2-2				
s, & Traces of Sa Clayey Silt w/Fin ck Spots Silty CLAY w/Blac Fine Sand @ 14.0'	6-6 ck 2-2				.0
Clayey Silt w/Finck Spots Silty CLAY w/Blac	6-6 ck 2-2				-6
ck Spots Silty CLAY w/Blac Fine Sand @ 14.0'	6-6 ck 2-2				
Fine Sand @ 14.0'	2-2	1			-
& Black w/Sand		1	/		
o brack wy Jania	2-3		P.		
ckets @ 19.0'	2-2	-			
& Black @ 22.0'	2-5				
rk Gray w/Black & Spots @ 24.0'	2-2		0	$\uparrow$	+-
ark Gray Below	1-1				
Silty Clay	2-10		6		
				++-	++-
contd.	3-10				
-	Silty Clay Interbedded Claye y SILT, & Fine Se contd.	Interbedded Clayey y SILT, & Fine SAND contd.  3-10	Interbedded Clayey y SILT, & Fine SAND contd.  3-10	Interbedded Clayey y SILT, & Fine SAND contd.  1-1  2-10  b  3-10	Interbedded Clayey y SILT, & Fine SAND contd.

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		DEPTH (FT.)	SAMPLE	SAMPLE TYPE	īES	DESCRIPTION OF	BLOWS	DRY UNIT WEIGHT	° ′	05	7.D	= 1.5		) 25 <del>-   -  </del>
		JEPTI	SAN	SAN	NOTES	MATERIAL	<b>B</b> CC	N N	m. + -	w	ATER	CON	TENT.	ų.
	- {					ELEVATION 392 19		DRY	ļ. ,	20	40	60	80	
			13	22		Dark Gray Interbedded Clayey							11	
컨	إد					SILT, Sandy SILT & Fine -SAND Seams							III	
Roberts	Black													
า	4	<u> </u>				Dark San Silan Sina SAND						11	4.4	_ _
		-40 <b>-</b>	14	SS		Dark Gray Silty Fine SAND w/Clay	12-18		Н			╁┼	+	
98₹	9	-						7	$\parallel$		╂-╂-	+ +-	╅┥	
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4/22/80	Yes					·								
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	Hallow Auger	<b></b>				]		}	H	-	╂-┼-	┨ -	+	
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•		PROJ	ECT_	<del>,</del>		Amoco Waste Disposal Site	BORING		7			JO	1   1   1   1   1   1   1   1   1   1	<b>W</b>	Ę	
	1			<u></u>				Ŧ		S	HEAR		ENG			U : 2
		DEPTH (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DAY UNIT WEIGHT	0	0.5	-+-	1.0	- 1.9 <del>  </del>	\$ <del>  </del>	20	· 2
		) GE	ωz	S	Z	SURFACE ELEVATION 434.68	60	U Y HO	+ -		WATE	<u>R</u> •	, <u>cc</u>	NTE	NT. %	ب <del>ب</del> ۱۰
						Dark Gray Silty CLAY					$\top$	T				1
Roberts	ack		1	SS		-Black w/Sand Below 1.5' -w/Rock Fragment @ 1.9'	6-7	,			-	$\vdash$			+	+
۳	8	-5 -	2	SS	HCa0dor	Black Fine Sandy SILT	4-3						Z			
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ا		_10 _	4	SS	HCa0dor	Dark Gray & Black CLAY w/ Oxidized Spots	4-6				1	1			丰	+
			5	SS	HCa0dor	Black Oily Silty FLYASH	2-5				#				P	$\mp$
- (						-w/Wood Fragments @ 14.0'					I				1	Ţ
£		_15_	6	SS	HCa0dor		6-4				+	╀	H	-	╬	+
4/18/80	Yes		7	SS	HCa0dor	Black & Dark Gray CLAY w/Si Pockets & Oxidized Spots	4-4				T				- - - -	
DATE DRILLED_	PIEZOMETER	20 -	8	SS	HCa0dor	Gray & Black Fine SandySILT w/Silty Clay Seams	2-2	:			1	$\frac{1}{1}$		/		
_ DATE			9	\$\$	HCa0dor	Dark Gray & Black Fine Sandy Silty CLAY -w/Silty Fine Sand Seams @	3-5				1		/		+	-
	B.	25 _	10	SS	HCa0dor	21.5' -Gray & Black @ 24.0' -w/Silt, Silty Pockets, &	3-5					0				
80	. X		11	SS	HCa0dor	Traces of Fine Sand Below	8-13			P	4	+			+	<del> </del>
770-80	H.A	_30 _	12	SS	HCa0dor	·	12-14				+	+			0	+
	ЕТНОО		13	\$5	HCa0dor		2-2			Φ	+	X			+	Ŧ
ACT	Š		1	<del> </del>	1					1	士	1			士	
CONTRACT	DRILLING METHOD	-35 -	14	SS	WB Below	Black & Dark Gray CLAY contd.	1-2			ð	$\frac{1}{1}$				1	+
	_		GPC:	ND W4	TER DERTH	AT COMPLETION AFTER 1	l dave	33 0		ETER						-

-JOHN MATHES & ASSOCIATES. INC. -

5'

	PROJ	ECT_	<del></del>	Amoco	Waste Disposal Site	BORING		co	ntd.	Jo			ES	
1				<u> </u>		1	Ħ			EAR ST	RENG	тн.	rsf (	DU 2
	(FT.)	SAMPLE	SAMPLE	ËS	DESCRIPTION OF	BLOWS	WEIG	0	0.5	1.0		.5 <del>                                     </del>		2 5
	DEPTH (FT.)	SAN	SAM	NOTES	MATERIAL	BLO	DRY UNIT WEIGHT	n.	<u> </u>	ATER	<u> </u>	DNTE	NT, 9	<u>.                                    </u>
					ELEVATION 399,68		Ę	P	20	40	. 6	ю 1	■0	100
		14	- 33	Below	Black & Dark Gray CLAY		-		1			$\prod$		
		15	ss <sup>-</sup>	35.0'	-Gray & Dark Gray @ 36.0'	-1-2			6			7		
100		16	SS	1	-w/Silty Partings	2-3				11.	1	$\Box$	$\perp$	$\bot$
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1	40 -	1			Dark Gray Silty Fine SAND	8-7	-	-	<del>                                     </del>	++	╁╌	╂╼┼	+	+-
9	<b></b>	17	\$\$	]				$\vdash$	┢┼	+-	-	$\vdash$	+	+
LOGGED				1				╟─		++-	+-	+	+	
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Ī										11	†	$\Box$	十	1-
1	45 -	18	SS	Í	-Fine-Medium Below 45.0' -w/Traces of Clay @ 45.0'	12-21	1			1		$\sqcap$	$\top$	
l		'			Willaces of Clay e 45.07	12-21	•					П		
			1											
						L						$\Box$		
	-50 -	19	SS		-w/Traces of Lignite Below 50.0' TOB	20-23					-		$\overline{\perp}$	
_					10D			<b> </b>		++	+-	$\dashv$	+	
7	-	{		1			1		-	+ +-	+-	╁╾┼	+	+
		1						$\Vdash$	-	+-	+	+	+	-

CONTRACT 770-00 DATE DRILLED 4/19/80 DRILLED BY

DATE DRILLED PIEZOMETER

DRILLING METHOD H.A. & W. B.

770-ou

CONTRACT

-55

DRILLED BY

GROUND WATER DEPTH AT COMPLETION	AFTER 11 days	33.9' AFTER	
SCALE 1" =5'			

JOHN MATHES & ASSOCIATES, INC.

1 1	I	1 SS HCaOdor Dark Brown & Brownish Silty CLAY w/Sand  2 SS HCaOdor Dark Brown & Black Silf Fine SAND  4 SS HCaOdor WOOD  4 SS HCaOdor WOOD  5 SS HCaOdor Dark Gray & Black Silty CLAY  Dark Gray CLAY w/Silt, Black Spots & Roots  7 SS HCaOdor Dark Gray & Black Silt Interbedded w/Fine San Silt Seams  B SS HCaOdor Black @ 19.0'  9 SS HCaOdor Black CLAY w/Silt & Si Pockets  Dark Gray & Black Silt Interbedded w/Fine San Silt Seams  Black @ 19.0'  9 SS HCaOdor Black CLAY w/Silt & Si Pockets  Dark Gray w/Black Spot 26.5'  Black & Dark Gray @ 2  Black & Dark Gray CLAY w/Silty Parting WB Below 31.5'  WB Below 31.5'  WB Below 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WB Below 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WB Below 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'  WOOD & Dark Gray & Black Silty Parting 31.5'		BORING			_ 		#1						
	ОЕРТН (FT.)	SAMPLE	SAMPLE	NOTES	MATERIAL	BLOWS	DRY UNIT WEIGHT	# + -	0.1	WATI	1.0	1.4	S NTE	20 NT. 9	<del></del>
Black		1	SS	HCa0dor	Brown & Brownish Gray Fine Sandy Silty & LAY From 1.8' to 2.0' Dark Brown & Brownish Gray	4~3									+
3Y	_5 _	2	SS	HC a0dor	Dark Brown & Black Silty	2-2			1						
LOGGED BY		3	55	HCa0dor	WOOD	50/4··				$\bigvee$	-				$\frac{1}{1}$
1	_10_	4	SS	HCa0dor		3-2				1					1
		5	SS 1	HCa0dor	Silty CLAY	2-1			1	+					$\frac{1}{1}$
Yes	_ 15_	6	SS	HCa0dor	'	4-5				7					+
			SS	HCa0dor	Interbedded w/Fine Sandy	3-5			<u> </u>	1					+
PIEZOMETER	_20_				-Black @ 19.0'	2-3			٥						$\frac{1}{2}$
Pig					Black CLAY w/Silt & Silty	13-13				1					+
W. D.	_ 25_				Pockets -Dark Gray w/Black Spots @ 26.5'	9-13									$\pm$
H.A. 0					-Black & Dark Gray @ 29.0'	10-15					-		Ρ / /		+
ı	-30-				Black & Dark Gray CLAY -w/Sandy Pockets @ 30.0'	12-16					X				丰
DRILLING METHOD	35_		-	WB Below 34.0	-Black W/Silty Partings Below   31.5'  -w/0xidized Spots @ 31.5'  -Dk Gr w/Blk Sp Below 34.0'	1-2			P '	$\frac{1}{1}$	+		Z		+
DE .		14	33		contd.  AT COMPLETION AFTER 13		33.6				1				1

PRO	DJECT _		Amoco	Waste Disposal Site	BORING	·	8 coi		AR ST		AATH	
OEPTH (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	P1	D.5	1.0 TER 40	<u>- 1.</u>	S I I	20
	14	\$\$		Black & Dark Gray CLAY -w/Sandy Pockets @ 30.0'								Ĩ
	15	SS		-Black w/Silty Partings Below 31.5' -w/Oxidized Spots @ 31.5'	2-1		+				1	+
-41		ss		-Dark Gray w/Black Spots Below 34.0'	2-2		4			-	•	
LOGGED BY	17	SS		Care Fine Food	5-3		1,					+
4	18	SS		Gray Fine Sand -Silty to 46.5'	12-13			+		-		+
		1										1
S - 5	0-											+
1												
PIEZOMETER 5-	5-			ТОВ								
	0_											
ME THOD										1		
DRILLING METHOD	_									-	-	<del> </del>

	PROJ	ECT_		DESCRIPTION OF MATERIAL  1.0' Water on Surface SURFACE ELEVATION	oco Waste Disposal Site	BORING	9	<del></del>	_		J	OHIN ) ASSOC		<u> </u>	
Ì			SURFACE ELEVATION LIR QR  Crushed STONE w/Soil  Gray Silty CLAY w/fine -w/Black Spots to 6.5'  -w/Oxidized Spots @ 6.5  Interbedded Seams, Gray CLAY, Silty Fine SAND & Fine Sandy SILT  Gray Fine Sandy SILT  Oark Gray CLAY w/Silt, Pockets & Oxidized Spot  SS  Gray CLAY -w/Oxidized Spots @ 21w/Black Spots Below 24 and Partings @ 24.0'		· · · · · · · · · · · · · · · · · · ·	Ħ	,		HEA	R ST	RENG			ر ب	
	DEPTH (FT)	SAMPLE	SAMPLE	NOTES	MATERIAL 1.0' Water on Surface	BLOWS	DRY UNIT WEIGHT	P1 -	0.i	WA.	1.0 TER 40	<u> </u>	5 <del>  - </del> ONTE	2.0 NT. %	, +
						·	_				Ť	+		7	┪
Black		1	SS		Gray Silty CLAY w/fine Sand	1-2			P	1					
	-5 -	2	SS			1-8				1	<del>-</del>	+-	$\left  \cdot \right $		-
OGGED BY		3	SS		-w/0xidized Spots @ 6.5'	WH-1			1	•		+-		+	+
100	-10-	4	SS		-w/Sand Partings	1-9								1	1
		5	ss!		Interbedded Seams, Gray Silty CLAY, Silty Fine SAND &	2-1					•			1	
	-15-	6	SS			WH-1				<i>!</i>	#	-			4
Yes		7	SS		Dark Gray CLAY w/Silt, Silty Pockets & Oxidized Spots	1-2			; p					+	
ETER	-20-	8	SS			1-1		-4	<i>;</i>			+-	$\frac{1}{1}$	1	
. PIEZOMETER		9	ss		-w/Oxidized Spots @ 21.5'	WH-1		р ф						#	
-	- 25-	10	SS		and Partings @ 24.0'	WH-WH				1	+	+		+	
ow Auger		11	<b>\$</b> \$		-Dark Gray Below 26.5'	WH-Wh			,					$\rightarrow$	
HOLO	- 30-	12	SS			WH-1						+	$\left\{ \cdot \right\}$	1	-
METHOD		13	SS						1-0		1			1	
DRILLING METHOD	- 35-	14	ss			WH-WH				-	$\frac{1}{1}$	+-	$\frac{1}{1}$	1	-

JOHN MATHES & ASSOCIATES. INC.

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	DEPTH (FT.)	SAMPLE	SAMPLE	NOTES	MATERIAL	BLOWS	DRY UNIT WEIGHT	PL.		WATE	R _	C	ONTE	NT. %	Ļ
	l°				ELEVATION 383.98		DAY	١	20	_1_	40	, •			_ + , 10
Black		14	33		Gray Fine SAND -Silty to 35.5'										  -
80					-Brownish-Gray @ 39.0' -w/Silt Below 39.0'	16-17	-			1	1			1	$\mp$
D BY D BY	-40-	15	SS		-w/Silt below 39.0				1	1	-	-		7	+
DRILLED BY LOGGED BY										+					+
	-45-	16	SS		-Fine to Medium @ 44.0'	12-15				+	-			+	$\mp$
			, ,							7-	-			+	+
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	- 50-										+	-	$\left  \cdot \right $	$\dashv$	+
4/ 16/00 Yes														1	工
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DATE DRILLED PIEZOMETER_															
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PROJECT \_\_\_\_\_Amoco Waste Disposal Site \_\_\_\_\_\_BORING 10



•		<b>БЕРТН (FT.)</b>	SAMPLE NUMBER	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	0	0.5	EAR ST	RENG			25
•		DEPT	SAN	SAN	O <sub>Z</sub>	SURFACE ELEVATION 435,08	BL	NO VRO	r+ -	, 20	ATER 40	<u>CC</u>		NT. %	_ u - +
_						Black & Brown CLAY w/Sand, Cinders & Gravel									
llengig	Black		1	SS		Brown Silty CLAY w/Fine Sand & Traces of Gravel	6-8			1	++	-			
<u></u>	<u>}</u>	_5 _	2	SS		Dark Gray CLAY w/Oxidized  Spots & Stains	4-6						\ \ \		
DRILLED BY	OGGED BY		3	SS		Brownish-Gray Clay w/Silt w/Oxidized Spots	4-6					0			
	١	- 10-	4	SS	Slight Odor	-Intermixed w/Si Clay @ 7.0' -Dk Gray From 9.0' to 18.0' -w/Silty Pockets & Black	2-2				ó				
			5	SS 1		Spots Below 9.0' -w/Clay Seams From 11.5' - 15.5'	2-3								
4,0,80		- 15-	6	SS			6-5			•			P		
'	Yes		7	SS	Slight Odor	-w/Sandy Seams Below 19.0'	2-4					/			
DATE DRILLED	PIEZOMETER _	- 20-	8	SS	Strong Odor	-w/sandy seams below 13.0	3-3				P,				
DATE	PIEZO		9	SS	Void  23.0' to  24.5'	Brownish Gray Silty CLAY w/ Fine Sand	4-7			•		1	R .		
		- 25-	10	SS	Water @ 24.0'	-Gray w/Black Spots @ 24.5'	X1-3						ì		
3	8 V.B		11	SS		Gray CLAY w/Silty Seams & Pockets, Oxidized Spots & Stains	5-6					,4		+	
770 <u>-</u> 00	A. H.	- 30-	12	SS		Dark Gray CLAY w/Silt, & Oxi Spots	2-2							1	
5	DRILLING METHOD		13	<b>S</b> S		-w/Traces of Fine Sand @9.0° -Gray w/Sandy lenses below 31.5'	2-2			C		+		+	
CONTRACT	JAILLING	- 35-	14	SS		Olive Silty CLAY w/Fine Sand Contd.	1-2					+			
	_	-	GROU	ND WA	TER DEPTH	AT COMPLETION AFTER _2	1 days	37.5	' ,	FTER					

— JOHN MATHES & ASSOCIATES, INC. –

SCALE 1" -\_\_

Amoco Waste Disposal Site 10 contd. PROJECT\_ BORING SHEAR STRENGTH, TSF DRY UNIT WEIGHT PCF DEPTH (FT.) SAMPLE BLOWS SAMPLE NOTES **DESCRIPTION OF** MATERIAL WATER CONTENT. % ELEVATION\_ 400.08 DIAVE SILTY CLAY W/Fine Sand 14 Brown Silty Fine SAND Black 5-6 15 55 -Clayey to 40.51 -Dark Gray w/Traces of 2-2 40-16 SS Lignite Below 39.0' 17 SS 3-3 Gray Fine Sandy Silt w/Silty 45\_ 18 SS 1-2 Clayey Partings Dark Gray Silty CLAY 19 SS 3-5 Gray Silty Fine SAND Interbedded Gray Fine SAND & Fine Sandy Clayey SILT Seams SS - 50-20 2-3 TOB

DRILLED BY \_\_\_ βY LOGGED 4/8/80 Yes DATE DRILLED PIEZOMETER - 55-B z. ⋖ Ξ. CONTRACT DAILLING

GROUND WATER DEPTH AT COMPLETION	AFTER 21 days 37.5 AFTER	
SCALE 1" =		

-JOHN MATHES & ASSOCIATES, INC.-

DOVIN WAR
JOHN MATHES

Amoco Waste Disposal Site PROJECT . \_ BORING \_ SHEAR STRENGTH, TSF DRY UNIT WEIGHT PCF DEPTH (FT.) SAMPLE SAMPLE TYPE NOTES BLOWS **DESCRIPTION OF** MATERIAL WATER \_ CONTENT. % SURFACE ELEVATION \_\_422.60 Brown SAND w/Crushed Stone Black SS Brownish Gray Silty CLAY 2-3 1 w/Fine Roots Dark Brownish Gray CLAY w/ 3-6 5-2 SS Silty Partings & Oxidized Sp A -w/Silty Pockets & Black Spots € 4.0' LOGGED 4-6 3 SS -Brownish Gray & Gray Below 6.51 Gray & Dark Gray CLAY w/Silt 2-3 - 10-14 SS & Oxidized Black Spots Gray CLAY w/Oxidized Spots & Sandy Pockets 2-4 5 55 1 Gray CLAY w/Silt, Silty & Sandy Pockets 2-2 -w/0xi Sp & Stn @ 14.0' - 15-6 SS Brown Silty CLAY w/Fine Sand Yes 2-2 O 7 SS PIEZOMETER Brown Fine SAND 7-8 20-8 SS -w/Silt to 26.5' -w/Silty, Clayey Pockets 9:-13 to 24.0' 9 SS 10-12 -25- 10 55 Auger Water **@ 26.0'** -Gray & Brown w/Traces of 8-11 Lignite Below 26.5' 11 SS Hollow 16-21 30-12 SS TOB DRILLING METHOD

AFTER 23 days 24.51 GROUND WATER DEPTH AT COMPLETION \_\_\_\_\_ AFTER

SCALE 1" -\_\_

**DRILLED BY** 

DATE DRILLED

CONTRACT

35-

PROJECT Amoco Waste Disposal Site BORING 12



E E	3.6	<u>س</u>	ပ္သ	DESCRIPTION OF	SA	WEIGH	\$v 2	0,5	EAR STE	1.5	20	يو
ОЕРТН (FT.)	SAMPLE	SAMPLE	NOTES	MATERIAL	BLOWS	DRY UNIT WEIGHT	<b>PL</b> -	- <del>-</del> w	ATER	CONT	+ - + ·	<u>~</u>
-				SURFACE ELEVATION419_46		DR.		20	, 40	60	80	
				Brown Silty CLAY w/Roots		Ì					1	_
	1	\$\$	Strong Odor	Dk Gray CLAI w/Oxi Spots Gray Clayey SILT w/Blk Spots	3-3	1			P			_
5 -	2	SS	Very Strong Odor	Dark Gray Fine Sandy SILT w/Clay & Black Spots	3-4						++	_
	3	SS	4/18/80 Water @ 6.0'	Dark Gray Fine Sandy Silty CLAY w/Black Spots	6-3							_
10_	4	SS		Black & Dark Gray CLAY w/ Silt & Silty Pockets -Dark Gray & Gray w/Oxidized	3-4	1						_
	5	SS:	Strong Odor	& Black Spots Below 11.5'	4-5	1				10		_
- 15-	6	SS	Strong Odor		1-2			,0				_
	7	SS	Slight Odor	Dark Gray CLAY w/Silty Partings -w/Black Spots to 23.0'	1-1		•	/				_
-20-	8	SS	Strong Odor		WH- 1			,				7
	9	ss	Strong Odor WB @	-Dark Gray & Black From 23.5	WH-WH							_
-25-	10	\$5	23.01	to 30.0'	WH-1							_
	11	SS			WH-1					-	<del>                                     </del>	1
-30-	12	SS		-w/Black Spots @ 31.0'	WH-2	-		+				_
	13	SS			3-4	]				1	$\prod$	
- 35-	14	SS		Dark Gray Fine SAND -Silty @ 35.5' 	10-11							

JOHN MATHES & ASSOCIATES, INC.

•	PROJ	ECT_		Amoco	Waste Disposal Site	<del></del>	BORING	12	CO	ntd.	ĵ	11 141	IES C	
	<u> </u>		<del></del> -	<u> </u>				Ħ		SHEA	R STR	ENGTH,	TSF O	
	DEPTH (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF		BLOWS	DRY UNIT WEIGHT PCF		0.5	1.0	1.5	20	2.5
	DEPT	\$5	SAN	2	MATERIAL		BLC	NO Y	Pt	WAT	ER .	CONT		
		ļ.—	ļ	ļ	ELEVATION 384 46	<del></del>		<u> </u>	<del> </del>	<del>20</del>	40	<b>80</b>	+-+-	100
بد			]		Dark Gray Fine SAND -Silty @ 33.5'									
Black					-Gray w/Silt Below 38	3.5'				+	+-		-	+
	_40_	15	SS				9-10							
LOGGED BY										#				
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DRILLING METHOD		1			·					11				$\prod$
מֿ נֿ	<b>L</b>	GROU	ND WA	TER DEPTH	AT COMPLETION	AFTER 12	days	20.1	#	FTER				
			E 1"	51			MATHE	 S &			IATI	ES. 11	NC.	-
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PROJECT Amoco Waste Disposal Site BORING 13 SHEAR STRENGTH, TSF UNIT WEIGHT \_ 0<u>P/2</u>\_\_ DEPTH (FT.) SAMPLE SAMPLE TYPE NOTES BLOWS 1.0 **DESCRIPTION OF** MATERIAL WATER \_ CONTENT % SURFACE ELEVATION 437 64
Dark Gray & Black CLAY w/Si, Sand, & Traces of Gravel Black 1 SS 1-2 w/HCa Odor 1-1 Black Silty CLAY w/Fine Sand w/HCa 5 2 SS 0dor -Black & Dark Gray Below 6.5' **-066ED** w/HCa -w/Traces of Cinders @ 6.5' 11-10 3 SS 0dor -w/Wood, Cinders, & Sludge w/HCa Below 9.01 11-4 10 4 SS 0dor WOOD w/HCa 5 50/2-1/2' -Black SLUDGE, & GRAVEL w/ Odor Silt @ 11.5' w/HCa - 15-| 6 14-1 SS Odor Yes w/HCa 7 SS 6-4 Odor Dark Gray & Black CLAY w/Si, PIEZOMETER w/HCa 20-8 SS 4-6 Wood Fragments, & Traces of 0dor Sand Black Clayey SILT w/HCa 4-6 9 SS Odor Dark Gray Fine Sandy SILT w/HCa 25 10 SS 4-6 w/Black Spots Auger 0dor Black Clayey SILT w/Traces w/HCa SS of Fine Sand 4-2 11 Hollow Odor Gray & Black CLAY w/Silt w/HCa 30 12 SS 1-2 0dor DRILLING METHOD Gray & Dark Gray CLAY

GROUND WATER DEPTH AT COMPLETION \_\_\_\_\_\_ AFTER 48 hrs. 3.0' AFTER 7 days 24.7' in Piezometer 37.21

-w/0xidized & Black Matter

-Black & Dark Gray € 34.0'

Contd. -

€ 31.5'

4-4

4-7

w/HCa

Odor

W/HCa

Odor

13

14

35

SS

SS

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Roberts

DRILLED BY

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DATE DRILLED.

770-80

CONTRACT

Black

DRILLED BY

DATE DRILLED

Auger

Hollow

SCALE 1" -\_\_

BORING 13 contd. Amoco Waste Disposal Site PROJECT. SHEAR STRENGTH, TSF DAY UNIT WEIGHT PCF DEPTH (FT.) SAMPLE NOTES BLOWS **DESCRIPTION OF MATERIAL** WATER \_ CONTENT. % Black & Dark Gray CLAY 402.64 Odor -Dark Gray w/Black Spots From 36.5' to 44.0' 2-3 15 SS 1-1 40-16 \$5 LOGGED BY -And Black @ 41.5' 17 SS WH-1 -Black Below 44.0' WH-2 18 45-SS -Dark Gray w/Silt Partings & Sand Seams @ 46.5' ss1 2-6 19 Dark Gray CLAY w/Silt, Black Spots & Traces of Shell's Dark Gray Silty Fine SAND 50--w/Traces of Lignite @ 51.5' 8-12 20 SS PIEZOMETER -55-21 SS 16-22 TOB 60-DRILLING METHOD 37.2' 48 hrs. 3.0' 7 days AFTER\_ GROUND WATER DEPTH AT COMPLETION ...

"JOHN MATHES & ASSOCIATES, INC."

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PROJECT \_\_\_\_\_ AMOCO Waste Disposal Site \_\_\_\_\_ BORING \_\_\_\_\_\_

	E.	m &	<b>u</b>	S	DE003:37:01: 07	ဟ	WEIGHT	2	SHE 	AR STR	ENGTI		. <b>O</b> U/2
	ОЕРТН (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	PCF ¥	Ĭ-	<del>                                     </del>	+ + -	+	+ +	2.
j	OEP	S N	SA	¥		BL	DRY UNIT	PL + -	w.	ATER .	CON	TENT.	% LI
					SURFACE ELEVATION 436.50		OR	0	20	40	<b>60</b>	- B(	10
					Dark Brown Silty CLAY			_		<del>                                     </del>			
송		1	SS		Black & Dark Gray Silty CLAY w/Sand, Cinders, & Traces of	6-9		-		╂-	-		
Black	<b>-</b>			]	BrickFranments_Wood&_Gravell	0 )		-	$\vdash$			+	
					Black Sandy SILT				<del>                                     </del>				
<u>}</u>	- 5-	2	\$5	HCa0dor	-	1-2							
LOGGED BY		3	SS	HCaOdor	Black Clayey SILT -w/Cinders @ 6.5'	1/18''		<u> </u>		$\bot\bot$		$\angle$	
LOGGED BY				ļ	w, 01110213 E 0.3	17.13		<b> </b>		+	+		+
		,						┢		- -	/	$\dagger \dagger$	
	- 10-	4	<u> </u>	HCa0dor		WH-WH					Z		
			1					<u> </u>		-	- `		$\perp$
		5	SS	HCaOdor Water@		1/12''-1		-			<del>                                     </del>	4	$\dashv$
	$\vdash \vdash \vdash$			14.0'					- -		+		
o l	- 15-	6	<u> </u>	HCaOdor		1/1"-1/17"	! 						
None				UC = 0 -1 =	DarkGrayCLAY w/BlackSpots &			<u> </u>				$\square$	
	<b> </b>	7	SS		Sand Partings	2-4		<b> </b>	├	<del>                                     </del>	-		
PIEZOMETER_					DarkGray&Olive CLAY w/Silt, Black Spots & Sand Partings			╟─		1	+	+	
PIEZOMETER	- 20-	8	SS	HCa0dor	Black Fine Sandy Silty CLAY	1-2	,		1				
EZO		_							,				
		9	SS	HCa0dor		2-3		<b> </b>		╫╌	<del>-</del>	+	+
}								<u> </u>		╂╂╌	+	╂┤	+-
Je L	- 25~	10	SS	HCa0dor		1-1			<u> </u>	1			
Auger		1		{	Dark Gray CLAY w/Silt & Oxi-								$\prod$
8	<b></b>	11	SS	HCa0dor	dized Spots	1-1		-	B	<del> </del>			
Hollow				}	Dark Gray & Black CLAY					₩.	╁╌╂╌	+	-
{ I	_ 30_	12	\$\$	1	-w/Oxidized Matter @ 29.0'	2-2						1-	
Į Į				1	Dark Gray from 31.5 to 35.5' w/Oxidized Spots @ 31.5'					N			
ME		13	SS	{		1-1		<u> </u>			$\bigcup$		
DNI)		_			Black Spots @ 34.0'			-	<del>                                     </del>	+-+	1	+-	+-
DRILLING METHOD	-35-	14	SS	}	Contd.	1/9"-1/9"			1,0	1-1-			士
-		GROUI	ND WA	TER DEPTH	AT COMPLETION AFTER			,	FTER_		_	_	

-JOHN MATHES & ASSOCIATES. INC.

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	DEPTH (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	<b>91</b> +	<del>  -  </del>		TER		-	ONTE	+	+	
ı	6				ELEVATION 401 50		DAY	0	, 2	۰ ۱	4	•	•		<b>8</b> (		10
ŀ		14	22		Dark Gray CLAY -w/Black Spots @ 34.0'				,	/				$\prod$			_
Ì		15	SS			1-1			ď					۶			_
ŀ	-40-	16	55			2-8			4				1				<u> </u>
ŀ		1			Dark Gray Silty Fine SAND w/			$\vdash$	H	$\dashv$				$\vdash$	$\dashv$	_	_
-		17	SS		Traces of Lignite TOB	3-4									4		
ŀ	-45-																_
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l			1														_
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JOHN MATHES & ASSOCIATES, INC.

SCALE 1" -

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DEPTH (FT.)	SAMPLE	SAMPLE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT PCF	P. +		ATER	<u>COI</u>	NTENT.	
			<b> </b>	SURFACE ELEVATION426_12	·	[ <u> </u>	10	<del>  2°</del>	+-1	+ +		_
				Crushed STONE and GRAVEL								
- 5-	1	SS	I .	Black Fine Sandy SILT w/Cin- ders	3-4							
	2	SS	Slight Odor	-w/Wood & Clay € 6.0'	6-4		┡	-	+		<del>-</del>	-
- 10-	3	SS	4	Brownish-Gray CLAY w/Silt & - Traces of Sand	4-5			1				
	4	SS;	Strong Odor	Brownish-Gray Fine Sandy SILT	2-2				\/\frac{1}{\tau}	++		
- 15-	5	ss	Odor Water @	-Black @ 13.5'	1-1			/	/			-
	6	SS	15.5'	Dark Gray CLAY w/Silt & Black Spots	1-1	!   		6				-
-20-	7	55		Dark Gray CLAY w/Black & Oxi- dized Spots Dark Gray & Black Silty CLAY	3-3				<b>\</b> /			-
	8	ss		Dark Gray CLAY	1-2					$\prod$		
-25-	9	SS	Wash Bore Began @	-w/Black Spots @ 22.0' -Gray & Dark Gray w/Oxidized Spots & Stains @ 23.5' -Dark Gray & Black @ 26.0'	1-1			7				-
	10	SS	25.0'	- Dark Gray & Brack & 20.0	1-1		E	K			1	
-30-	11	SS	1	-Black& Dark Gray below 28.5' Dark Gray Silty Fine SAND	2-5	1		0		$\frac{1}{1}$	-	+
	12	SS		-w/Traces of Lignite to 35.5'	5-3					++		-
-35-	13	ss	1	Contd.	10-12			$\Box$	+	++	+	+

JOHN MATHES & ASSOCIATES. INC.

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SCALE 1" -\_\_\_

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Bignall

DATE DRILLED.

CONTRACT

GROUND WATER DEPTH AT COMPLETION \_\_\_\_

BORING 15 Contd. PROJECT \_ AMOCO Waste Disposal Site SHEAR STRENGTH, TSF DRY UNIT WEIGHT DEPTH (FT) BLOWS SAMPLE SAMPLE NOTES **DESCRIPTION OF** MATERIAL WATER \_ CONTENT % ELEVATION \_\_\_\_\_ 391\_12 Dark Gray Silty Fine SAND 13 SS -w/Traces of Lignite to 35.5' 14 SS -Gray below 36.0' 12-14 Black -w/Traces of Lignite below 38.5' SS 15 10-13 40-TOB LOGGED BY 45-PIEZOMETER Yes œ. 3 DRILLING METHOU.A. AFTER 18 days 25.31 AFTER\_

SCALE 1" -\_ – JOHN MATHES & ASSOCIATES. INC.  $\overline{\phantom{a}}$ 

ı	PROJI	ECT_	<b>A</b>	10CO Was	te Disposal Site	BORING		16	_	5	// Calling	WATT.	些	
[							E		SH	EAR S	TREN	GTH.	TSF	
	ОЕРТН (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	0 Pt +	0.5 + +	1 0 VATER	- -+-	1.5 <del>  </del>	20 10 NT. %	2
					SURFACE ELEVATION 435.26		, HO	0	20	40	_	60	BO	10
					Dark Gray & Dark Brown CLAY w/Gravel Concrete& Wood Frag-			<u> </u>	<del>   </del> -		+	-	+	+
90 8		1	\$\$	HCa0dor		6-8			1			10		
=					Dark Gray & Black Silty CLAY			_	$\Box$	1-1	1			
_  ≥	- 5-	2	SS		w/Oxidized Spots & Sandy Pockets	2-3			o f					1
LOGGED BY		3	SS	HCaOdor	-Brownish-Gray & Black w/Sand Partings below 6.5'	1-2			0		+			
-	- 10-	4	\$\$	HCa0dor	Dark Gray CLAY w/Silt -w/Sand Seam From 9.7 to10.0!	2-4					P			
. ∤ <b>I</b>		'	Ĭ	1		<u> </u>		<u> </u>		<del>-   / -  </del> ,	<u>,                                    </u>	+		
		5	55	HCaOdor	-w/Sandy Pockets & Partings below 11.5'	3-7				1	1			‡
	- 15-	6	SS		Dark Gray Sandy CLAY w/Brick Fragments	10-17					b D			
Yes		7	SS		Black CLAY -w/Asphalt, Wood, Cardboard, & Filter Cell @ 16.5'	11-16								+
METER	- 20-	8	ss	HCa0dor	-w/Wood Fragments below 19.0'	9-13		_		1		<u>,                                    </u>		$\top$
PIEZON		9	55	HCa0dor	Brownish-Gray & Black Silty CLAY	12-18				• •	7			1
В.	- 25-	10	SS	HCa0dor	Brownish-Gray SILT w/Black & Oxidized Spots Black Silty CLAY	4-6				1				
. E V.		11	SS	26.5' HCaOdor	Black CLAY w/Silt	2-2			C	<u> </u>	+			+
H. A	30	12	SS	HCa0dor	-Dark Gray below 29.0' -w/Black Spots @ 29.0'	2-3					1			
된	<b></b>	13	SS	HCa0dor		3-3			- -	<del>                                       </del>	+	+	$\vdash \vdash$	+
IG ME		14	SS	}	Dark Gray CLAY -w/Oxidized Spots @ 33.0' &	. !-2			;	5 6	$\uparrow$			1
DRILLING METHOD	- 35-	1	-		Black Spots to 39.0' Contd.				1		$\overline{+}$	1	1	igg

AFTER 13 days 20.51 GROUND WATER DEPTH AT COMPLETION

Black

DATE DRILLED

H.A. & W.B.

CONTRACT

BORING 16 Contd. AMOCO Waste Disposal Site PROJECT\_ SHEAR STRENGTH, TSF DRY UNIT WEIGHT PCF DEPTH (FT.) SAMPLE SAMPLE TYPE NOTES BLOWS 10 **DESCRIPTION OF** MATERIAL WATER \_ CONTENT. % 400.26 ELEVATION . 15 SS Dark Gray CLAY WH-2 -w/Black Spots & Partings to 39.0° \$ 30.0° cms/sec 16 SS WH-2 40-DRILLED BY \_ ⊢Dark Gray & Black @ 40.0° 17 **S**S 1-2 -w/Silty Partings below 40.0' -w/Gray&DarkGrayw/Seams below 18 9-14 55 Gray Silty Fine SAND 45. 19 SS 35-35 50 20 SS 19-26 TOB PIEZOMETER 55 8 ž w H.A. DRILLING METHOD CONTRACT GROUND WATER DEPTH AT COMPLETION \_\_\_\_\_\_ AFTER 13 days 20.5 SCALE 1" - 5'

-JOHN MATHES & ASSOCIATES, INC. extstyle e

## RECORD OF SUBSURFACE EXPLORATION \_\_\_\_\_ BORING \_\_\_\_\_ AMOCO Waste Disposal Site PROJECT \_ SHEAR STRENGTH, TSF ONY UNIT WEIGHT - O<u>F</u> 2 -DEPTH (FT.) SAMPLE BLOWS SAMPLE TYPE NOTES ١٥ **DESCRIPTION OF MATERIAL** WATER CONTENT. % 429.19 SURFACE ELEVATION Brown Silty CLAY Interbedded & Intermixed Light 2-2 w/HCa 1 SS Gray FILTER CELL, Black FLY Odor ASH, COKE Silty SAND & Dark Gray Silty CLAY 5w/HCa 4-3 2 SS LOGGED BY Odor w/HCa 1-1 ₹₽ 3 SS Odor w/HCa 4 1-6 10-SS Odor Dark Brown CLAY w/Black Spots & Silty Pockets & Partings w/HCa Sζ 4-5 5 Odor TOB -15-Auger **₩**010€ DRILLING METHOD GROUND WATER DEPTH AT COMPLETION \_\_\_\_\_\_ AFTER \_\_\_\_ AFTER\_

-JOHN MATHES & ASSOCIATES. INC.:

SCALE 1" - 51

						- <u></u>	Ę		v	HEA	R ST	REN	GTH	. TSF	_ <b>O</b> U :
	DEPTH (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF MATERIAL	BLOWS	DRY UNIT WEIGHT	0 Pt+	0.	WAT	1.0	-+-	1.5 CONT	+	- <del> </del>
	Ľ.				SURFACE ELEVATION 434 43	<del>-</del>	DRY	0	<u> </u>	) <u>1</u>	40		60		μ¢ ,
Black		1	SS		Dark Brown & Brownish-Gray Silty CLAY w/Wood Fragments & Traces of SAND	2-4			P		<b>P</b>	+	<u> </u>		
	- 5-	2	SS		Dark Gray & Gray CLAY w/Silt, Black Spots, & Sand Partings -Gray & Dark Brown	2-2			0	1		<u> </u>	<u> </u>		
LOGGED BY		3	SS	HCa0dor		3-2		-	<i>'</i>			+	+	-	
	- 10-	4	SS	HCa0dor	Black FLY ASH	1-2					1	+	+		H
		5	ss¹	w/HCa		WR/18''				1		1	1		
None	- 15-	6	SS	w/HCa	Black Silty Fine SAND	WR/18''				$\frac{1}{1}$	_	+	$\perp$	1	H
- 1		7	SS	w/HCa	-Oily @ 17.5'  Black Oily Silty CLAY	WH-WH							1		
PIEZOMETER _	- 20-	8	SS	w/HCa	-Black & Olive @ 21.5'	WH-WH						+	+	<del> -</del>	$\frac{1}{1}$
PE		9	SS	]	Black SILT -Oily @ 24.0'	9-16					7	† 	1		
Auger	- 25-	10	\$8	HCa0dor	Dark Brownish-Gray Gray Silty CLAY -w/Black Spots @ 24.5'	5-9				-	1	+	+	<del> </del>	
Hollow /		11	SS	HCa0dor	-Black below 26.5' TOB	8-11						1	1		
1	- 30-											+	<u>+</u>		
DAILLING METHOD												+	+	-	
JAIL	1	1				1						士	土		口

-JOHN MATHES & ASSOCIATES. INC.

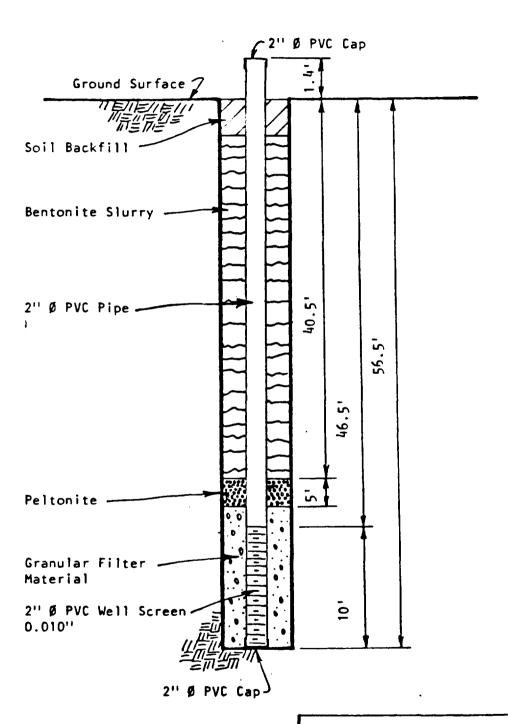
PROJECT \_\_\_\_\_\_ AMOCO Waste Disposal Site \_\_\_\_\_\_ BORING \_\_\_\_ 19

DRILLED BY ...



						<del>=</del>		SHE		ENGTH, TSF					
	E	ωŒ	w	S	D500D1D7101105		ÆIG	0	0.5	10	15	2 0	٠.		
	DEPTH (FT.)	SAMPLE	SAMPLE TYPE	NOTES	DESCRIPTION OF  MATERIAL	BLOWS	DRY UNIT WEIGHT	<del></del>	+	+	<del>                                     </del>	<del></del>			
	OEP	SAU	SA	ž		8	5	<b>*</b> +	WA.	TER .	CO	NTENT.	<u>م</u> در		
	L				SURFACE ELEVATION 437.46	<del></del>	<b>E</b>	° +	20	40	60	1 80	, 100		
	ļ				Dark Gray CLAY w/Gravel										
Black	<u> </u>	,	SS			1-3	ĺ	b	1		$\vdash$	++			
B16		'	33						$+ \forall$	-		+			
	<b>—</b>		5.5	Slight	Dark Gray & Black Oily CLAY	101-10		70							
; , ,	5-	2	55	HCa0dor	w/Silt & Wood Fragments	WH-10			14			11	_ _		
ED 1	ļ	_							$A \rightarrow$		$\vdash$	$\dashv$			
LOGGED BY	-	3	55			12-3		<del>                                     </del>	+	-	$\vdash$	++			
1 1	-	_			Dark Gray & Black Sandy Claye				1	<del></del>		++			
1 1	10-	4	\$5	Water@	SILT w/Wood Fragments	2-1			$\perp$						
				l	Dark Gray & Black Sandy Claye	y 1-5		4		<u> </u>	$\sqcup$	$\downarrow \downarrow$	4		
	ļ	5	SS'	HCə	SILT w/Wood Fragments	1-2			++	<del>                                     </del>		$\dashv$	$\dashv$		
	-	}			Gray Clayey SILT w/Sand &				+-+	<del>                                     </del>	$\vdash$	+	+		
	- 15-	6	SS	HCa0dor	Wood Fragments	2-23		<del>│</del>				77			
None				 	Interbedded Black & Dark Gray				`\						
		7	SS	ncaudor	CLAY w/Silt & Silty CLAY w/	4-5			<b>\\</b> .	1.	-				
י ב <u>י</u>			<u> </u>		Sand & Wood Fragments DarkBrownCLAYw/Silt,BlackSpot	<u> </u>		-	+	5	-	++			
PIEZOMETER _	20-	8	SS	HCə	-w/TracesofWoodFragments@19'	3-6		$\vdash \vdash$	+ +	<del>,                                    </del>			$\dashv$		
PIEZOMETER					-DarkGray & Black Below 21,5'				1						
ָה אַ בּיי		9	SS	HCaOdor	Black & Dark Gray Silty CLAY	4-5				•					
	<u> </u>		<u> </u>		Lord Cray & Black w/FineSand	<del>,</del>			1		1-1	$\dashv \dashv$			
7	- 25-	10	SS	HCaOdor	Sandy Silt, ESeams Partings below 24.0 TOB	9-8		╟┼	1 7	•	+	++	+		
Aug					108				++	+	$\dagger \dagger$		_		
		]													
Hollow											1				
위	- 30-						1	$\vdash$			$\dashv$	-+-+	-+-		
8	-	-							$\dashv \dashv$		H	++	+-		
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DRILLING METHOD									$\Box$			44			
3 5	L	<u> </u>		<u> </u>	<u> </u>										
		GROU	ND WA	TER DEPTH	AT COMPLETION 4.01 AFTER			AF	TER_		_	_			

-JOHN MATHES & ASSOCIATES. INC.



Not to Scale

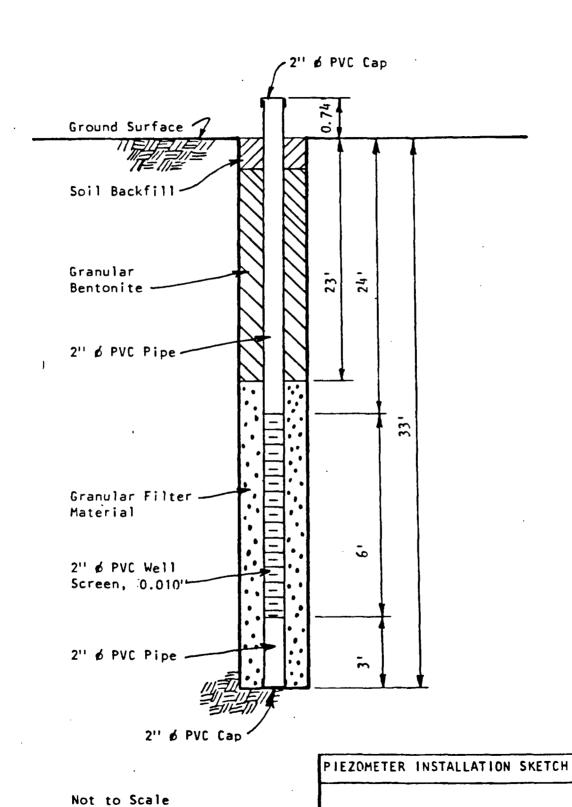
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PIEZOMETER INSTALLATION SKETCH

Piezometer 1

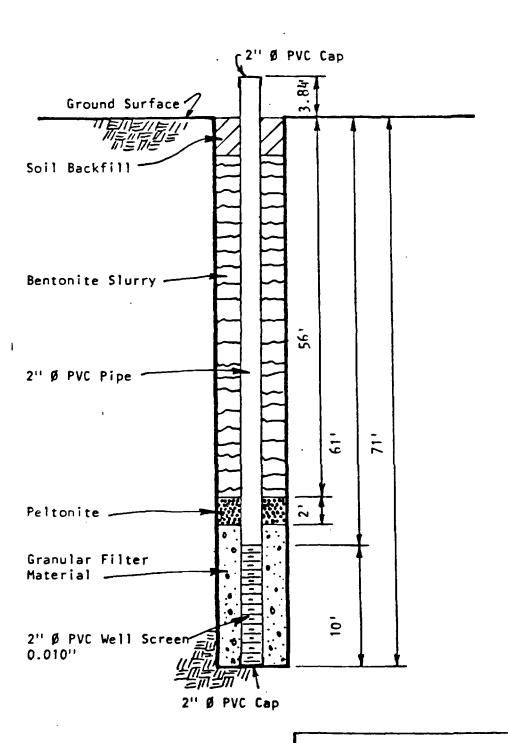
AMOCO Waste Disposal Site Hartford, Illinois



Piezometer 15

Hartford, Illinois

AMOCO Waste Disposal Site

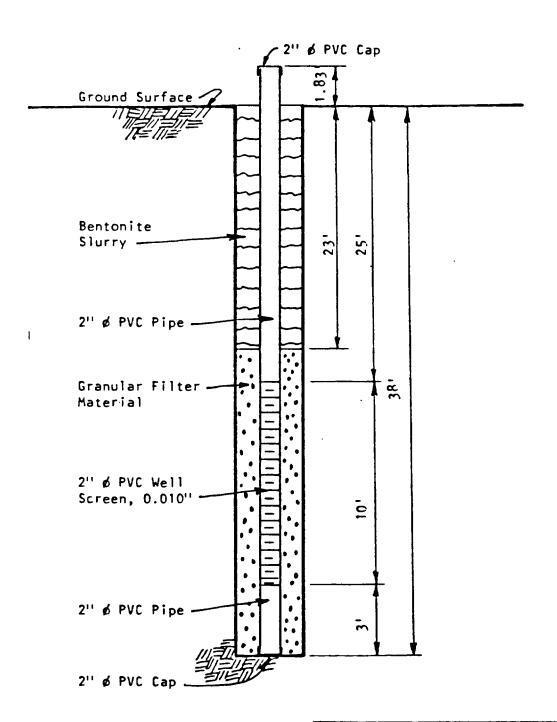


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PIEZOMETER INSTALLATION SKETCH

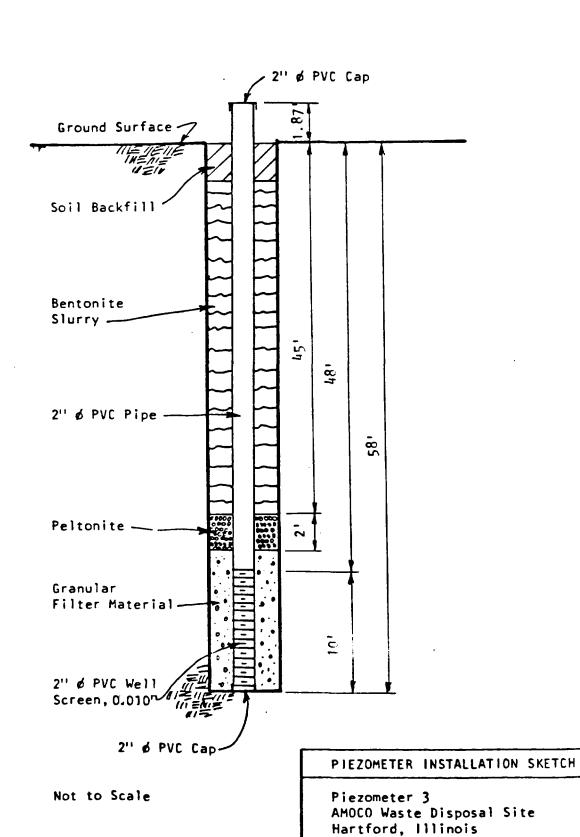
Piezometer 2 AMOCO Waste Disposal Site Hartford, Illinois

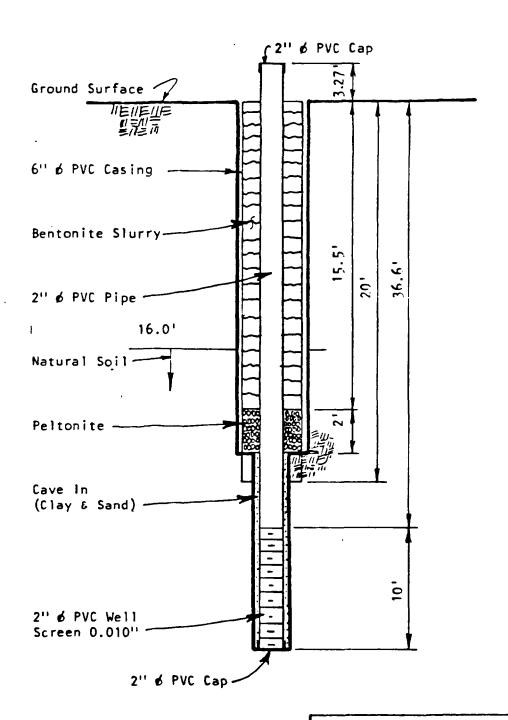


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PIEZOMETER INSTALLATION SKETCH

Piezometer 2S AMOCO Waste Disposal Site Hartford, Illinois

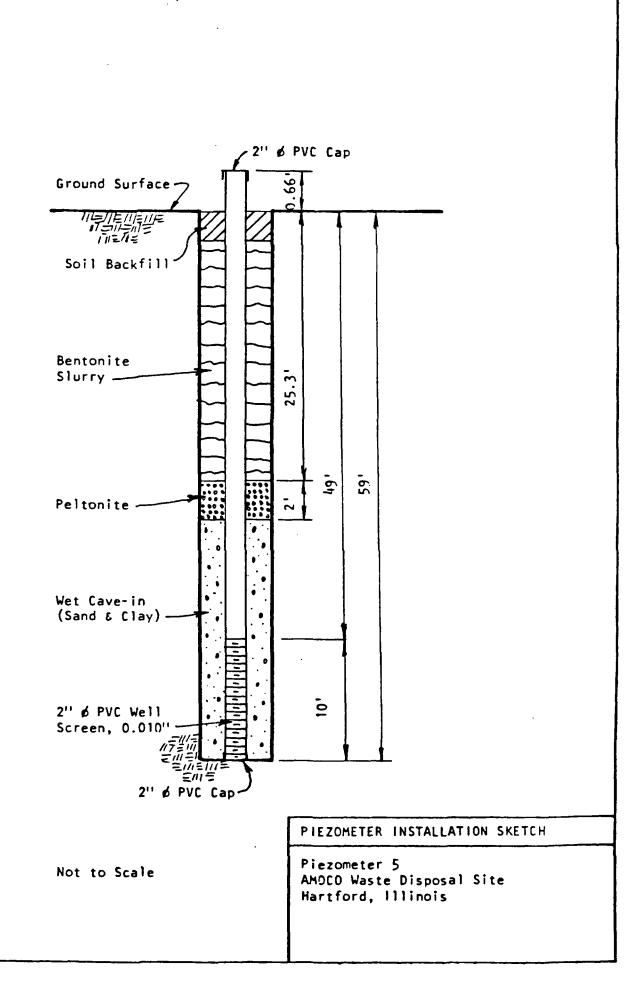




PIEZOMETER INSTALLATION SKETCH

Piezometer 4 AMOCO Waste Disposal Site Hartford, Illinois

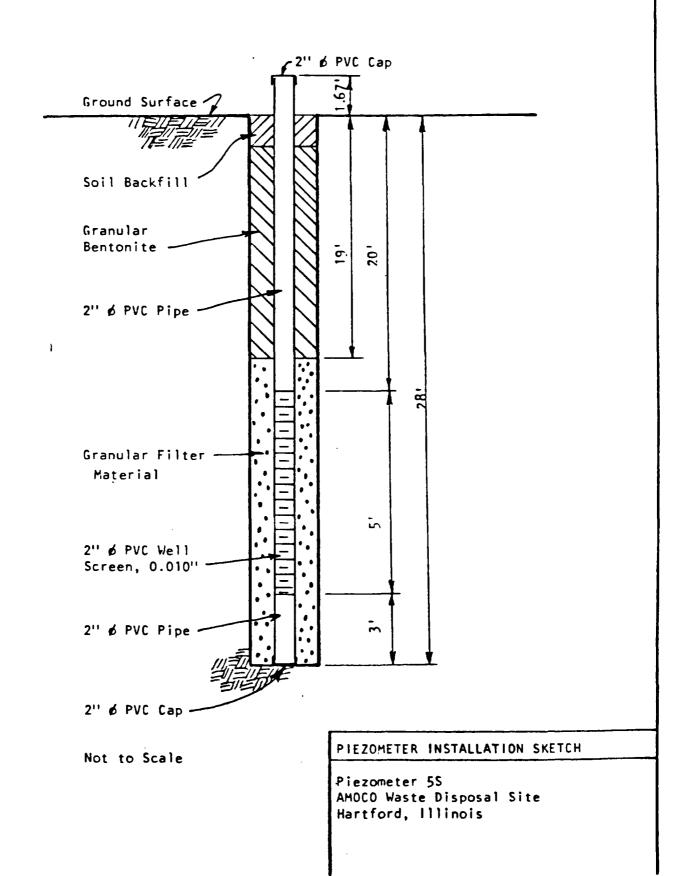
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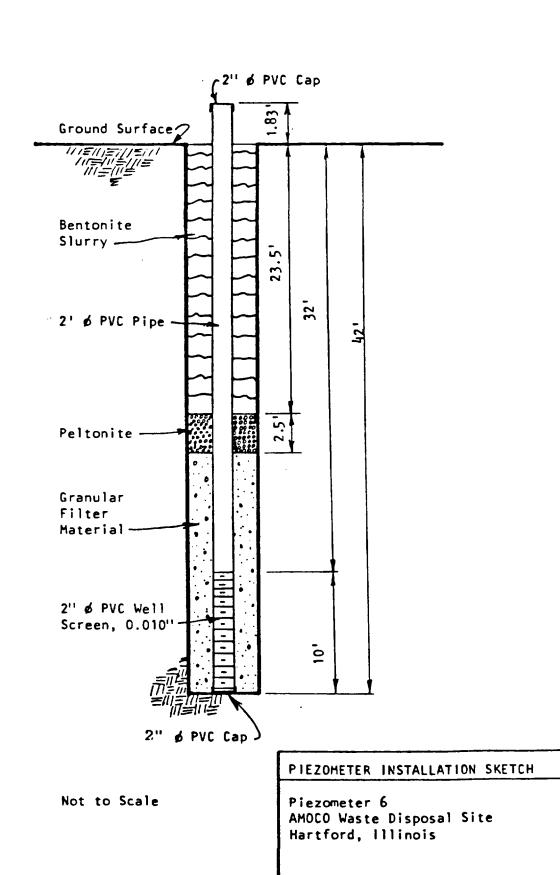
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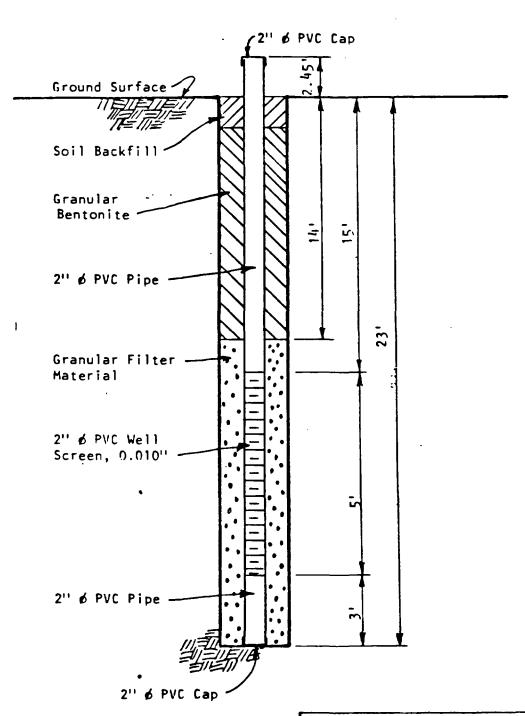
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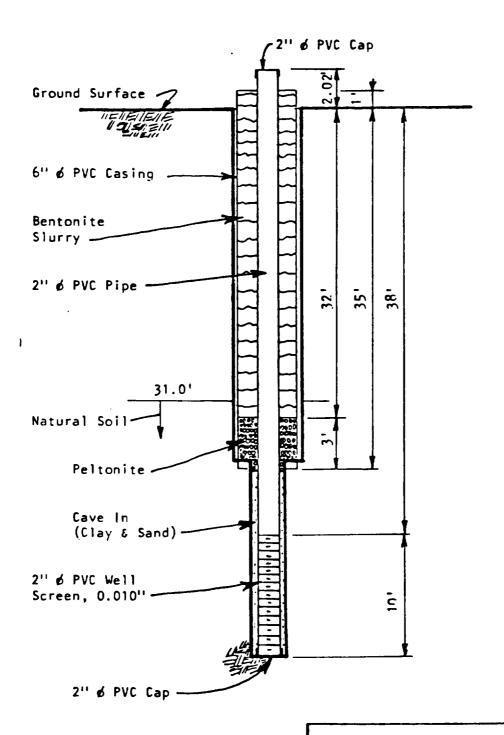
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PIEZOMETER INSTALLATION SKETCH

Piezometer 65 AMOCO Waste Disposal Site Hartford, Illinois

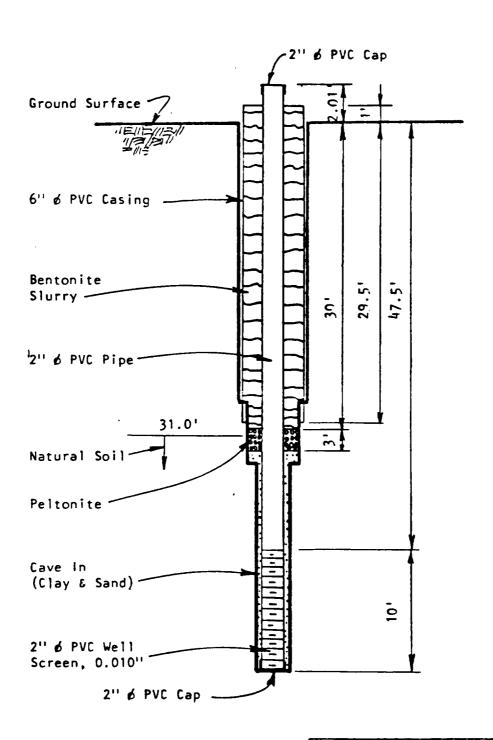


PIEZOMETER INSTALLATION SKETCH

Piezometer 7 AMOCO Waste Disposal Site Hartford, Illinois

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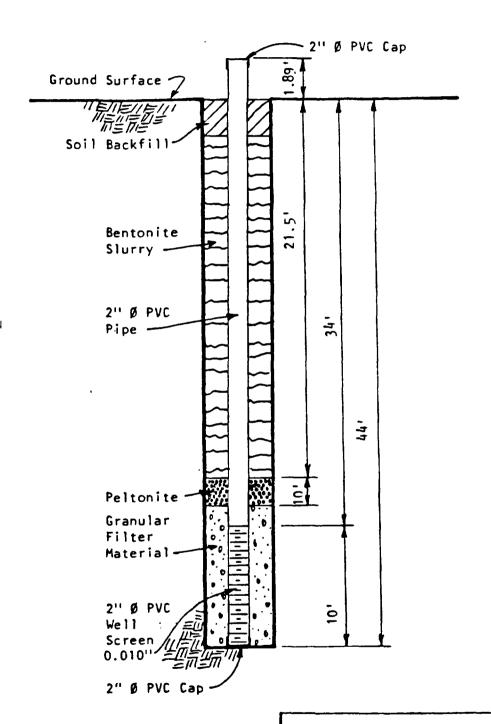


PIEZOMETER INSTALLATION SKETCH

Piezometer 8 AMOCO Waste Disposal Site Hartford, Illinois

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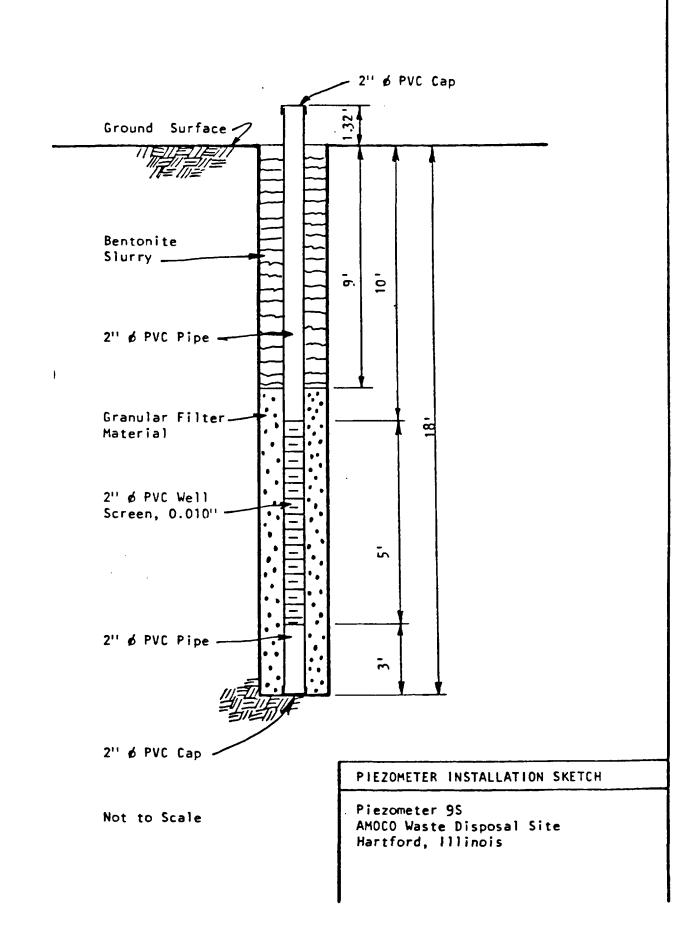
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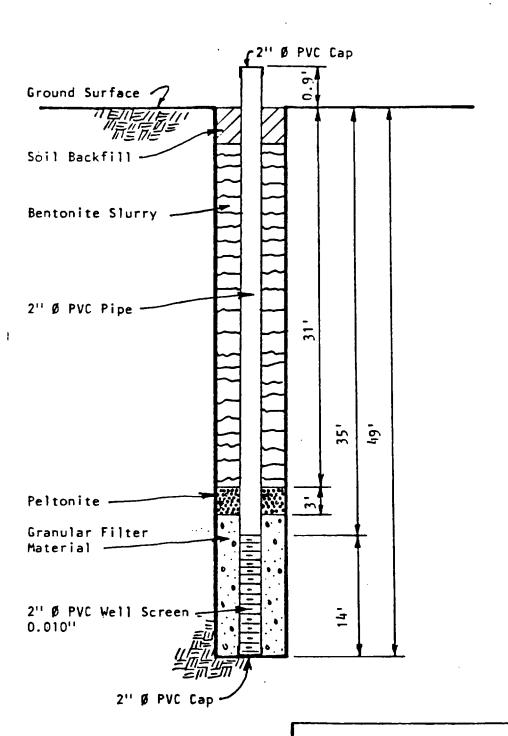
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PIEZOMETER', INSTALLATION SKETCH

Piezometer 9 AMOCO Waste Disposal Site Hartford, Illinois



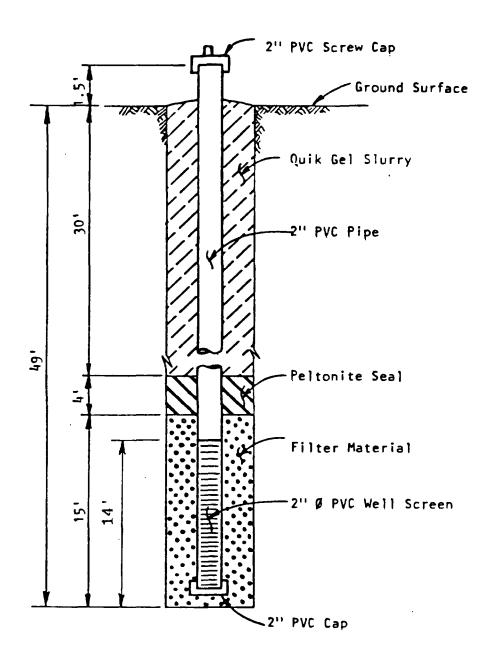
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PIEZOMETER INSTALLATION SKETCH

Piezometer 10 AMOCO Waste Disposal Site Hartford, Illinois

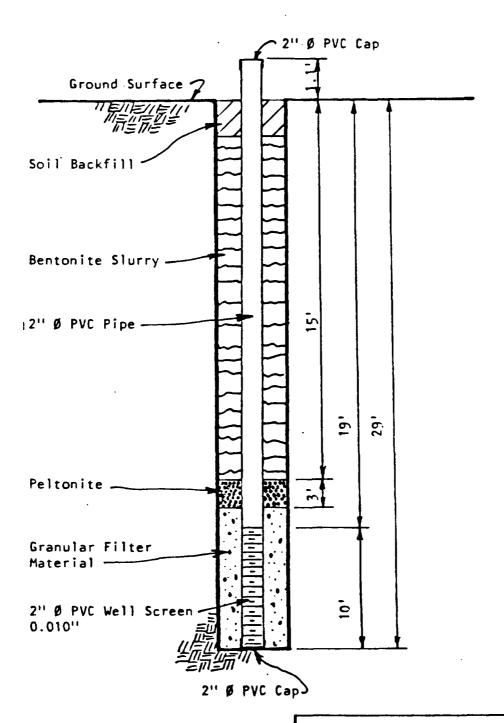


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### MONITOR WELL INSTALLATION SKETCH

Monitor Well 1QA AMOCO Oil Company Waste Disposal Site Wood River, Illinois



PIEZOMETER INSTALLATION SKETCH

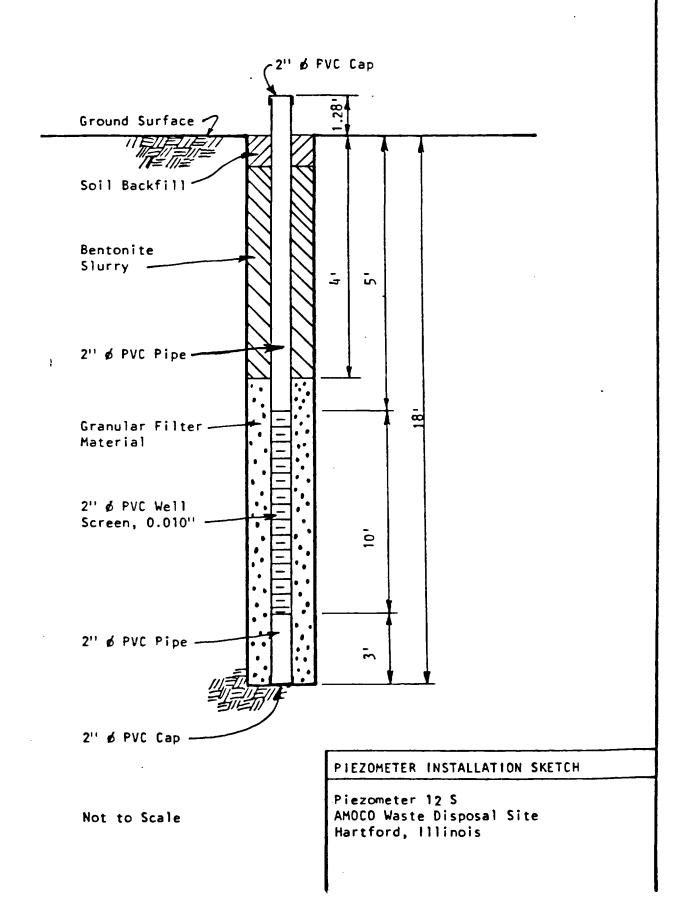
Piezometer 11 AMOCO Waste Disposal Site Hartford, Illinois

2" ø PVC Cap Ground Surface 7 5 認 6" ø PVC Casing \_ Bentonite Slurry \_ 2" & PVC Pipe -171 33.5' 18.51 Natural Soil-Peltonite -Cave In -(Clay & Sand) 2 2" & PVC Well Screen, 0.010" 2" & PVC Cap

PIEZOMETER INSTALLATION SKETCH

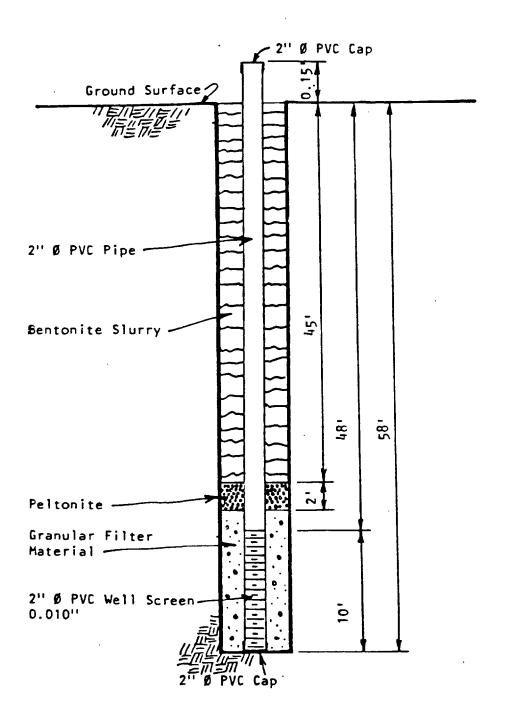
Piezometer 12 AMOCO Waste Disposal Site Hartford, Illinois

Not to Scale



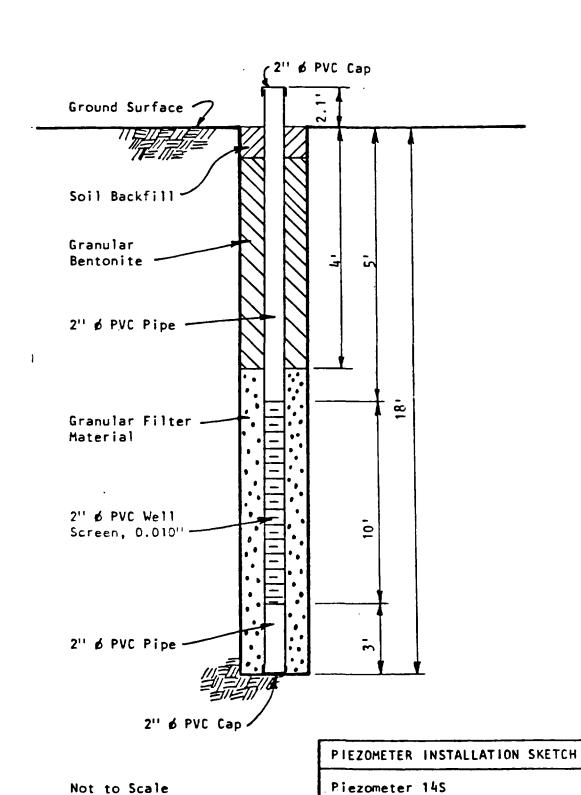
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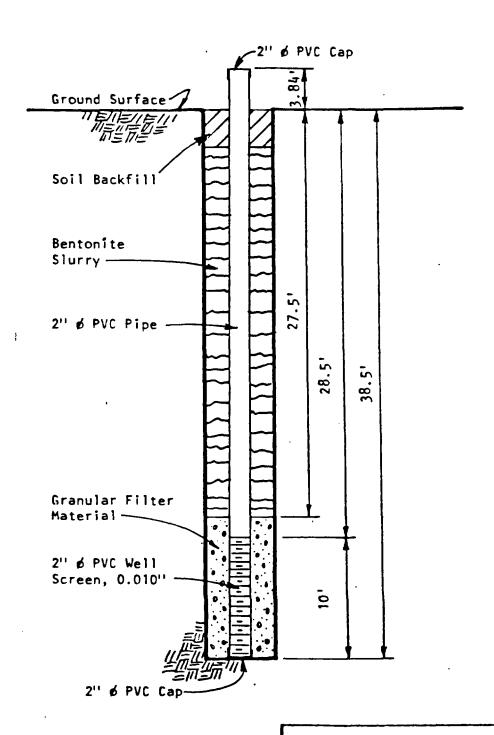
PIEZOMETER INSTALLATION SKETCH

Piezometer 13
AMOCO Waste Disposal Site Hartford, Illinois



AMOCO Waste Disposal Site

Hartford, Illinois



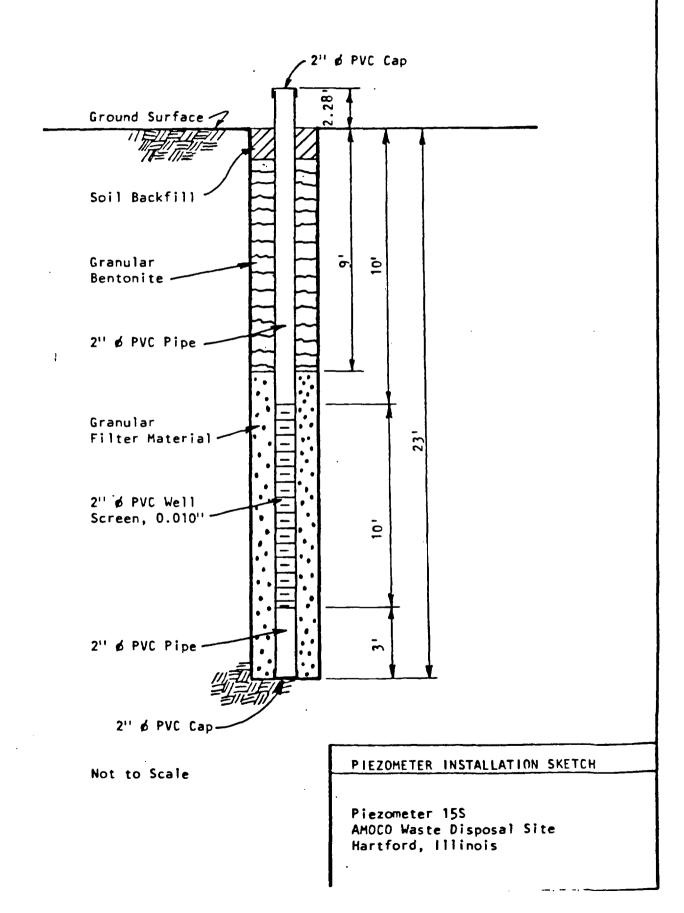
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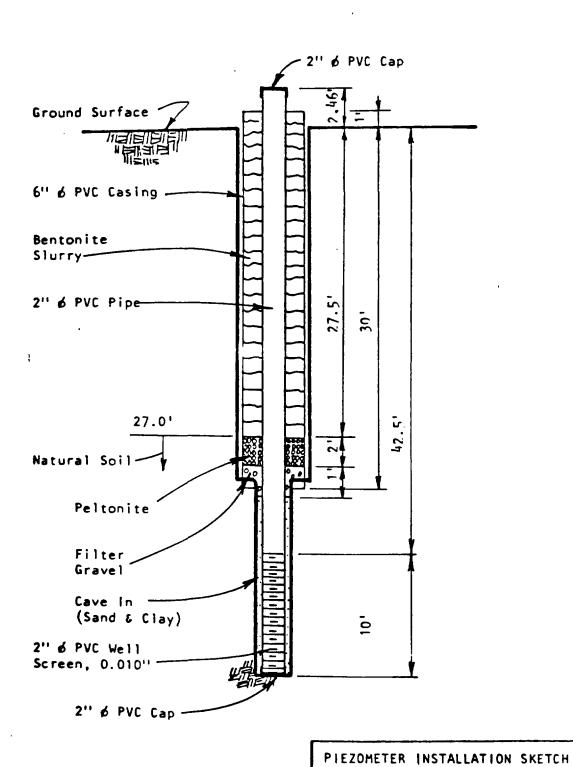
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PIEZOMETER INSTALLATION SKETCH

Piezometer 15 AMOCO Waste Disposal Site Hartford, Illinois

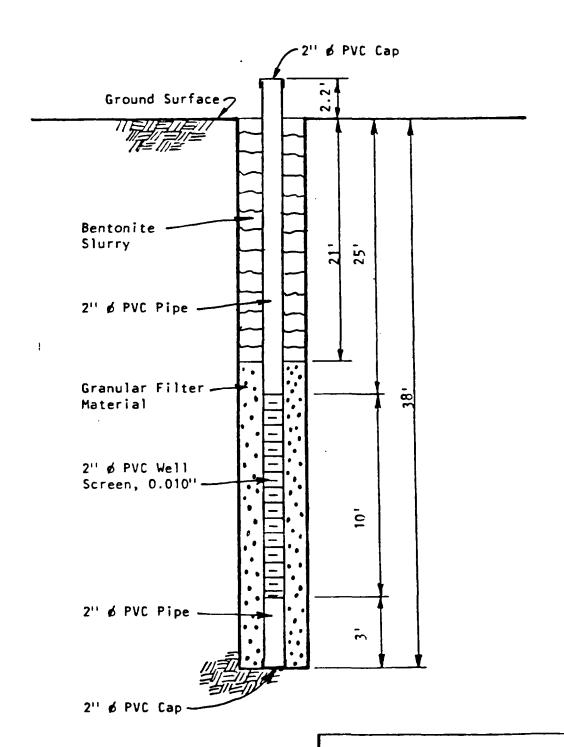




Piezometer 16

Hartford, Illinois

AMOCO Waste Disposal Site



PIEZOMETER INSTALLATION SKETCH

Piezometer 16S AMOCO Waste Disposal Site Hartford, Illinois

SUMMARY OF
PERMEABILITY TEST RESULTS

Boring	<u>Sample</u>	Description	K cm/sec
2	19	Gray Clay	2.82×10 <sup>-8</sup>
5	13	Gray Clay	1.29×10 <sup>-8</sup>
16	16	Dark Gray Clay	3.06×10-8

# NOTATION USED ON RECORD OF SUBSURFACE EXPLORATION

Adv	-	Advanced	Qp	-	Calibrated Penetrometer			
AR	-	Auger Refusal - Unable .	QU	-	Unconfined Compressive Strength			
		to Advance Augers	Quu	-	Unconsolidated Undrained Triaxial			
AS	•	Auger Sample			Compressive Strength			
BC	-	Bi-Cone Rotary Rock Bit	Rec	-	Recovered			
BS	-	Bulk Sample	RQD	-	Rock Quality Designation			
DB	-	Drag Bit	\$\$	-	Split Barrel Sampler 1-3/8"			
DCI	-	Dry Cave-in			1.D., 2" O.D.			
DS	-	Denison Sampler	SSR	-	Split Barrel Sampler Pefusal Less Than 1" Penetration for 50 Blows of 140			
FA	-	Flight Auger			Pound Hammer Falling 30"			
Gs	-	Specific Gravity	sv	-	Shear Vane			
HA	-	Hollow Auger	TC	-	Tri-Cone Rotary Rock Bit			
LL	-	Liquid Limit	тов	-	Termination of Boring			
LS	-	Large Diameter Split Barrel	WB	-	Wash Boring			
		Sampler 2-1/2" 1.D., 3" 0.D.	WC I	_	Wet Cave-in			
NR	-	No Recovery	WS	-	Wash Sample			
NX	-	NX Diamond Rock Core	2T		Thin Walled Tube Sampler 2" 0.D.			
05	-	Osterberg Sampler		-	·			
ΡI	_	Plastic Index	3T	-	Thin Walled Tube Sampler 3" 0.D.			
PL	-	Plastic Limit	Ø	-	Angle of Internal Friction Degrees (Total Stress)			
PS	-	Piston Sampler, Using 3" O.D., Thin Walled Tube	Ø	-	Angle of Internal Friction Degrees (Effective Stress)			
Qcu	-	Consolidated Undrained Triaxial Compressive Strength	₽	-	Piezometric Level			

### DESCRIPTION ABBREVIATIONS

Black - Blk	Gray - Gr	Root/Roots - Rt
Brown - Br	Interbedded - InB	Sand/Sandy - Sa
Calcareous - Calc	Intermixed - InM	Silt/Silty - Si
Carbonaceous - Carbon	Mottled - Mtd	Slickensides - Sk
Clay/Clayey - Cl	01ive - 01	Spots - Sp
Concretions - Conc	Organic - Org	Stains - Stn
Dark - Dk	Oxidized/Oxidation - Oxi	Traces - Trc
Fine - Fi	Partings - Ptg	Varved - Vvd
Gravel - Gvl	Pockets - Pkt	Yellow/Yellowish - Yel



#### NOTATION USED ON RECORD OF SUBSURFACE EXPLORATION

₿	L	0	W	S

5 - 7

Each integer under the heading BLOWS refers to the number of impacts of a 140 pound hammer falling a distance of 30 inches to cause a standard split barrel sampler (1-3/8" 1.D., 2" 0.D.) to penetrate a distance of 6 inches. The pair of integers shown are for the last 12 inches of a total of 18 inches of penetration, the sum of which is the "N" value. The number of impacts for the first 6 inches of penetration, which is known as the seating drive, is regarded as unreliable and is not shown.

20 - 60/2"

The first integer refers to the number of impacts as described above to cause a standard split barrel sampler to penetrate a distance of 6 inches. The second integer refers to the number of impacts required to cause the same sampler to penetrate an additional indicated number of inches. The number of impacts for the first 6 inches of penetration is not shown.

60/2"

The first integer refers to the number of impacts required to cause the sampler to penetrate the indicated number of inches. The number of impacts for the first 6 inches of penetration is not shown.

X60/2"

X indicates Seating Drive could not be achieved. Total penetration of the sampler is the indicated number of inches.

WR

WR indicates that the sampler penetrated under the static loading of the weight of the drill rod.

WH

WH indicates that the sampler penetrated under the static loading of the weight of the drill rod and the weight of the 140 pound hammer and its appurtenances.



#### GENERAL NOTES

The number of borings is based on topographic and geologic factors, the magnitude of loading, the size, shape and value of the structure, and the consequences of failure. The type and sequence of sampling is selected to minimize the possibility of undiscovered anomalies. Attempts are made to detect and/or identify occurrences during drilling and sampling such as: Encounter of water, boulders, gas, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation in driving resistance, unusual odors, etc. However, lack of mention of such variations does not preclude their presence.

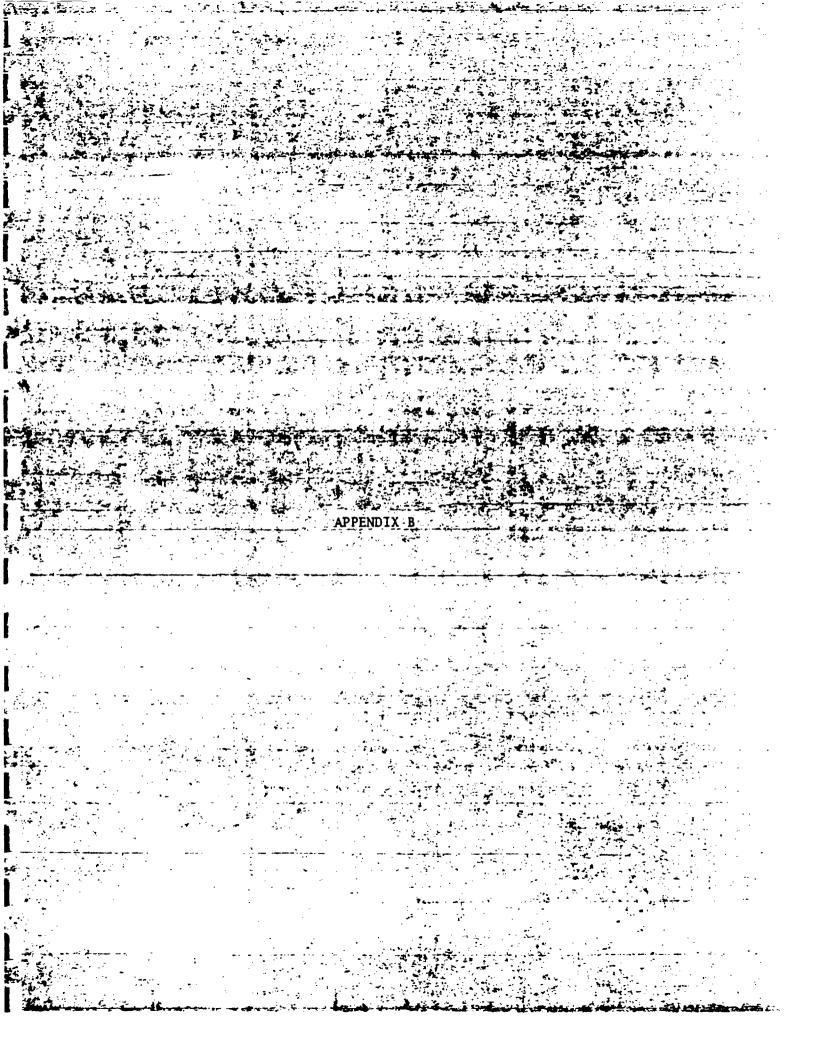
Although every attempt is made to obtain stabilized water level readings, the water levels shown on the Records of Subsurface Exploration may not have been stabilized and consequently may not represent present or future water levels. Groundwater levels may vary significantly over time due to the effects of temperature, precipitation, or other factors not evident at the time of exploration.

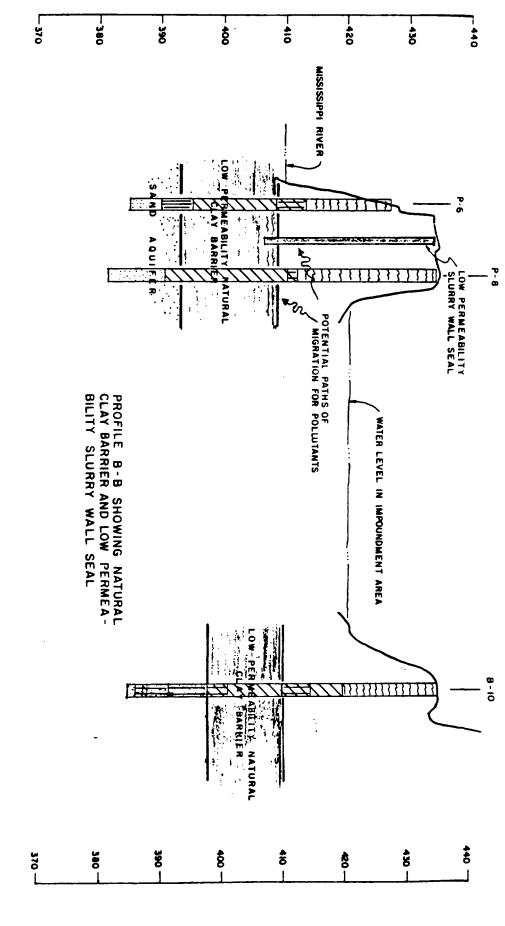
Unless otherwise noted, soil classifications indicated on the Records of Subsurface Exploration are visual classifications and are not the result of classification tests. Although visual classifications are performed by experienced technicians, classifications so made may not be conclusive.

Generally, variations in texture will be logged as strata changes. However, minor anomalies and changes of questionable lateral extent may be recorded under Notes. The lines indicating changes in strata on the Records of Subsurface Exploration are approximate boundaries only as the actual strata change may be between samples or the strata change may be a gradual transition.

Samples chosen for laboratory testing are selected in such a manner as to determine the physical characteristics of each material encountered. However, as samples are recovered only periodically and only representative samples are tested, the results of such tests may not conclusively represent the characteristics of all subsurface materials present.







RIVERFRONT DISPOSAL SITE

APPENDIX C



# Standard Oil Company (Indiana) Naperville, Illinois

July 25, 1980

R. D. Walker Amoco Chemicals Chicago, MC 4302

# Analysis of Wood River Landfill Samples

We have completed the analysis of 21 water samples and 26 soil samples received during May 1980 from monitor wells and core sampling done by Environmental Engineering, Inc. at the Wood River riverfront landfill site.

Tables I, II and III give data on the water samples. The samples ending in "S" (except P-9S and P-12S) were generally more contaminated than the others and had a high solids content. Sample P-10 was about 30% oil, which appeared to be a crude oil fraction. No other samples had significant amounts of free oil. However P-6S, P-14S, P-15S, P-16 and P-16S were high in total organic carbon and P-6S and P-15S were high in phenols, indicating the presence of soluble organic material. Heavy metal contents were generally low although copper, nickel and zinc were somewhat high in a few samples. pH was high for P-6S and P-15S, indicating some dissolved caustic.

Soil samples (Table IV) were analyzed only for oil and pH, the latter to indicate the presence of caustic. Oil contents varied widely and in one case (Boring No. 6, Sample No. 6) sulfur was found instead of oil. Borings No. 4, 16, 17 and 18 showed the highest oil content. pH was high in borings 6, 7 and 12--indicating the possible presence of caustic wastes.

The analyses were done under Analytical Project 58-3521 at a cost of \$13,404.

R.F. Babuch

R. F. Babcock Mail Station B-3

X5229

jmp Attachments

H. M. Brennan, Chicago, MC 3802

L. J. Duffy, B-3

J. G. Huddle, Chicago, MC 1201

M. F. Oxenreiter, H-3

F. J. Piehl, B-5

E. J. Sullivan, Wood River

R. A. Symuleski, Chicago, MC 3801

E. G. Lesko

E. G. Feeko

Mail Station B-3

X5268

TABLE I
Wood River Landfill Water Samples

mg/£									
	Alkalinity			C1 <sup>-</sup>				Conductivity	
Sample	mg/1 CaCO <sub>3</sub>	HCO;	<u>CO3</u>	Br-	F <sup>-</sup>	P0=	504	umhos/cm	рН
P-1	400	488	0	24	0.3	<1	<b>9</b> 9	900	7.8
P-2	271	331	0	36	0.4	1	54	780	7.7
P-3	282	344	0	61	1.0	3	21	<b>8</b> 80	7.9
P-4	272	332	0	106	1.0	5	90	1200	7.0
P-5	370	451	0	150	0.4	15	621	2230	7.6
P-6	334	407	0	<b>8</b> 5	0.4	3	165	1340	7.5
P-6S	1094	122	652	442	2.0	6	2019	10,200	9.4
P-7	344	420	0	177	0.4	1	54	1390	7.5
P-8	_ 218	266	0	28	0.3	<1	87	550	7.6
P-9	<del>-</del> 222	271	0	37	0.3	1	54	<b>6</b> 00	7.6
P-9S	<b>6</b> 6	81	0	36	1.0	<1	45	400	7.5
P-10 ①	713	870	0	64	0.2	1		2020	7.2
P-11	· 567	692	0	121	0.4	2	81	1570	7.7
P-12	379	462	0	58	0.3	1	78	<b>9</b> 70	7.3
P-12S	74	90	0	50-	-1.0	2	. <b>6</b> 6	480	8.2
P-13	249	304	0	92	1.0	2	30	<b>8</b> 50	7.6
P-14S	641	782	0	900	0.4	8	477	4900	7.4
P-15	320	390	0	140	1.0	2	96	1420	7.5
P-15S	1813	1000	400	1000	1.0	100	312	6700	9.6
P-16	816	<b>9</b> 96	0	3600	0.1	37	3	11,200	7.0
P-16S	988	1205	0	2500	0.2	43	195	<b>97</b> 00	7.4

This sample contained ~30% oil. The oil contained about 60% saturates, 35% aromatics and the rest polar material. It had a wide boiling range from C<sub>0</sub> to C<sub>20</sub>. Elemental composition was 85.9% C, 12.7% H, 0.64% S and 0.13% N. The oil appears to be a wide boiling crude fraction with very little oxidation.

TABLE II

Wood River Landfill Water Samples

						mg/l						<del></del>
Sample	TDS	TOC	COD	<u>Phenol</u>	As	Cr+6	<u> </u>	<u>Ba</u>	<u>Ca</u>	Cd	<u>Cr</u>	Cu
P-1	228	7	31	0.01	0.03	.004	0.3	<1	119	<.04	<.05	0.09
P-2	210	15	38	0.01	0.01	.006	11	<1	102	<.04	<.05	<.05
P-3	354	13	51	0.02	0.01	.010	4.1	<1	110	<.04	<.05	<.05
P-4	<b>56</b> 8	56	113	0.07	0.02	<b>.0</b> 06	6.2	<1	142	<.04	<.05	<.05
P-5	1576	40	159	0.01	0.01	.012	2.4	<1	<b>36</b> 0	<.04	<.05	<.05
P-6	548	35	107	2.5	Q.04	.008	0.6	<1	94	<.04	<.05	<.05
P-6S	<b>B</b> 882	517	5184	116	0.10	.010	5.1	<1	<b>7</b> 8	<.04	<.05	0.10
P-7	624	20	56	0.06	0.04	.006	0.7	<1	132	<.04	<.05	0.16
P-8	128	3	13	<.01	<.01	.002	2.7	<1	59	<.04	<.05	<.05
P-9	88	7	28	<.01	<.01	.002	3.4	<1	71	<.04	<.05	<.05
P-9S	80	7	43	<.01	0.02	.004	22	<1	41	<.04	<.05	<.05
P-10		51	86	0.02	0.11	.012	8.0	<1	· <b>4</b> 60	<.04	<.05	0.14
P-11	<b>3</b> 82	9	32	<.01	0.02	.010	1.5	<1	460	<.04	<.05	<.05
P-12	350	44	67	0.02	0.01	.006	1.2	<1	133	<,04	<,05	<.05
P-12S	134	39	218	2.6	0.01	.005	5.1	<1	36	<.04	<.05	<.05
P-13	324	65	230	0.08	<.01	*.008	2.0	<1	62	<.04	<.05	<.05
P-14S	<b>3</b> 078	304	1280	1.7	0.02	.008	20	<1	510	0.04	<.05	0.16
P-15	738	17	61	0.11	0.02	.008	2.2	<1	100	<.04	<.05	<.05
P-15S	5248	467	<b>3720</b>	<b>8</b> 5	0.03	<.002	6.5	<1	152	<.04	<.05	0.11
P-16	6952	218	880	5.4	0.09	.012	1.2	<1	800	0,05	<.05	0.11
P-16S	<b>5</b> 524	242	900	5.7	0.06	.008	1.2	<1	<b>4</b> 70	0.04	<.05	0.07

RFBabcock/jmp 07-28-80

TABLE III
Wood River Landfill Water Samples

mq/l

mg/ L												
<u>Sample</u>	<u>Fe</u>	Hg	<u>K</u>	Mg	Mn	Mo	Na	<u>Ni</u>	Pb		Zn	CN
P-1	17	.0006	2.9	40	3.5	<1	20	<.05	<0.2	<0.2	0.19	0.02
P-2	4.1	.0010	2.1	27	0.8	<1	30	0.05	<0.2	<0.2	0.13	0.02
P-3	1.2	<.0002	1.6	27	1.6	<1	50	<.05	<0.2	<0.2	<.05	0.01
P-4	17	<.0002	2.0	39	. 3,2	<1	40	<.05	<0.2	<0.2	<.05	0.01
P-5	2.1	<.0002	2.1	75	4.4	<1	100	0.07	<0.2	<0.2	0.07	0.61
P-6	6.3	<.0002	3.2	28 ,	1.8	<1	150	0.06	<0.2	<0.2	0.10	0.06
P-6S	12	<7②	7.8	5.2	0.8	<1	180	0.54	<0.2	0.3	0.59	0.25
P-7	6.2	.0008	3.5	37	2.5	<1	100	<.05	<0.2	<0.2	0.24	0.17
P-8	1.4	<.0002	1.6	27	1.0	<1	20	<.05	<0.2	<0.2	0.08	0.16
P-9	0.5	0.17	1.3	21	0.9	<1	20	<.05	<0.2	<0.2	0.08	0.15
P-9S	0.7	<.0002	1.2	16	0.3	<1	20	<.05	<0.2	<0.2	0.31	0.14
P-10	69	<.0002	1.8	107	7.8	<1	40	0.16	0.3	<0.2	0.34	0.13
P-11	3.4	<.0002	2,0	113	25	<1	70	0.16	<0.2	<0.2	0.27	0.10
P-12	11	<. <b>0</b> 002	2.4	63	2.3	<1	30	<.05	<0.2	<0.2	0.06	0.02
P-12S	0.4	<.0002	1.2	15	0.1	<1	40	<.05	<0,2	<0.2	0.07	0.01
P-13	1.5	<.0002	2.0	15	Ö.6	<1	100	<.05	<0.2	<0.2	0.09	<.01
P-14S	23	<.0002	21	<b>6</b> 8	3.5	<1	560	0.13	0.2	<0.2	1.07	<.01
P-15	4.3	<.0002	2.7	32	1.7	<1	130	<.05	<0.2	<0.2	0.36	<.01
P-15S	42	<.0002	3.6	17	2.8	<1	1360	0.27	<0.2	<0.2	0.19	0.20
P-16	57	<.0002	2.8	270	18	<1	1560	0.33	0.3	<0.2	0.21	<.01
P-16S	5.8	<.0002	7.6	161	5.7	<1	1520	0.23	<0.2	<0.2	0.08	<.01

This sample was initially analyzed as more than 18 mg/L Hg. However subsequent analysis of the dried solids from the sample did not detect mercury. No sample was left for further analysis, so the reported value of less than 7 mg/L is based on the solids analysis.

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TABLE IV
Wood River Landfill Soil Samples

	Sample	рН	<pre>% Oil (by CHCl<sub>3</sub>   extraction)</pre>	
Boring No.	Sample No.	Depth	<del></del>	
3	4	9-10.5'	9.0	<.05
3	5	11.5-13'	6.6	1.75
4	3	6.5-8'	7.0	6.55
4	6	14-15.5'	6.9	7.95
5	5	11.5-13'	7.1	<.05
6	6	14-15.5'	10.5	0.60 ③
3 4 4 5 6 7 7 7	5 3 6 5 6 5 8	11.5-13'	7.4	5.30
7	8	19-20.5'	9.4	0.80
7	11	26.5-28'	11.0	0.10
7	12	29-30.5'	11.2	<.05
12		6.5-8'	10.6	<.05
13	3 3	6.5-8'	7.3	<b>6.9</b> 0
13	10	24-25.51	8.4	<.05
14 :	5	11.5-13'	9.0	1.70
14	10	24-25.5'	9.3	<.05
15	5	13.5-15'	9.4	<.05
16	7	16.5-18'	7.1	38.3
17		1.5-3	5.8	11.45
17	1 2 3	4-5.5'	8.3	30.9
17	3	6.5-8'	7.8	20.1
17	4	9-10.5' Mid 6"	7.8	7.80
17	4	9-10.5" Bttm 6"	7.8	16.0
18	4	9-10.5'	5.8	6.05
18		14-15.5'	7.5	0.85
18	6 8 9	19-20.5'	9.5	10.2
19	9	21.5-23'	8.5	<.05

The reported oil value for this sample is not oil, but sulfur.

RFBabcock/jmp 07-28-80

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APPENDIX D



# Standard Oil Company (Indiana) Naperville, IL 60566

September 18, 1980

R. D. Walker Amoco Chemicals Chicago, MC 4302

# Analysis of P-10A Well Water 8/4/80--Wood River

We have completed the analysis of P-10A sent by E. Workman on 8/15/80. Results are given below in mg/1.

Sample	TOC	COD	Phenols	S04 <sup>=</sup>	s <sup>=</sup>
<del></del>					
P-10A	150	278	0.03	46	<0.4

The analyses reported herein were done on Analytical Request number 10241-071. The work was completed under Analytical Project 58-3501-09 at a cost of \$196.

E. G. Lesko Standard Naperville, B-3 X5268

/ch

R. F. Babcock, B-3 L. J. Duffy, B-3 M. F. Oxenreiter, H-3 F. J. Piehl, B-5

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# Standard Oil Company (Indiana)

Naperville, Illinois

-:

August 22, 1980

R. D. Walker Amoco Chemicals Chicago, MC 4302

#### Monitor Well Samples - Wood River Landfill

We have completed the analysis of five samples sent by E. J. Sullivan on July 31, 1980. Results are given below in mg/l.

<u>Sample</u>	TOC	COD	Phenol	50.	<u>s</u> =
P-1S	240	842	0.25	32	<0.2
P-5	55	121	<.03	423	11
P-5S	272	491	0.07	949	11
P-6	34	42	0.06, 0.04	31, 27	11
P-16	413	990	22, 25	14	11

Duplicate analyses were run for sulfate on sample P-6 and phenol on samples P-6 and P-16 because the results were considerably different than those found on samples with these designations taken in May 1980 and reported in my letter of July 25. It was not possible to run duplicates on any of the May samples because the extensive testing required did not leave sufficient sample for reruns.

As noted with the May samples, the. "S" samples, denoting shallow wells above the clay layer of the landfill, were generally more contaminated than the deep well samples. A notable exception is sample P-16 which is equally as contaminated as P-16S reported on in July. These two appear to be very similar samples, perhaps indicating no clay barrier at this point.

The analyses reported herein were done on Analytical Request No. 10219-063 under Analytical Project 58-3501-09 at a cost of \$853.

R.F. Babrock

R. F. Babcock Mail Station B-3 X5229

jmp

1

L. J. Duffy, B-3

E. G. Lesko, B-3

M. F. Oxenreiter, H-3

F. J. Piehl, B-5

E. J. Sullivan, Wood River

